

AMEI

RNAL

OF

OPHTHALMOLOGY

CONTENTS

Original Papers	Page
Headache. William H. Crisp	93
Sympathetic ophthalmia. Part II. Alan C. Woods	100
Scientific and practical considerations involved in the near-vision test with presentation of a practical and informative near-vision chart. James E. Lebensohn	110
Studies on the infectivity of trachoma. R. W. Harrison and L. A. Julianelle	118
Lipodystrophia progressiva with ocular complications. J. W. Charles and M. Hayward Post	126
Ophthalmic errors. Hans Barkan	129
The relation of accommodation to the suppression of vision in one eye. Glenn A. Fry	135
The nonsurgical treatment of nonparalytic strabismus. Samuel V. Abraham	139
Management of complications in the operation for senile cataract. Harry W. Woodruff	146
Notes, Cases, Instruments	
Remote point for visual-acuity tests. Frank G. Murphy	151
A combination loupe and head mirror. Conrad Berens	152
Society Proceedings	
Philadelphia, Chicago, New England	153
Editorials	
Contemporary critics of Graefe; Trachoma; Evaluation of clinical and laboratory findings	159
Book Notices	163
Correspondence	164
Abstract Department	165
News Items	192

For complete table of contents see advertising page V

Copyright, 1936, Ophthalmic Publishing Company, 640 South Kingshighway, Saint Louis, Missouri

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars.

Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company, 640 S. Kingshighway, Saint Louis, Missouri

Editorial Office: 640 S. Kingshighway, Saint Louis, Missouri

Entered as second class matter at the post office at Menasha, Wisconsin

MAKING IT

Easier

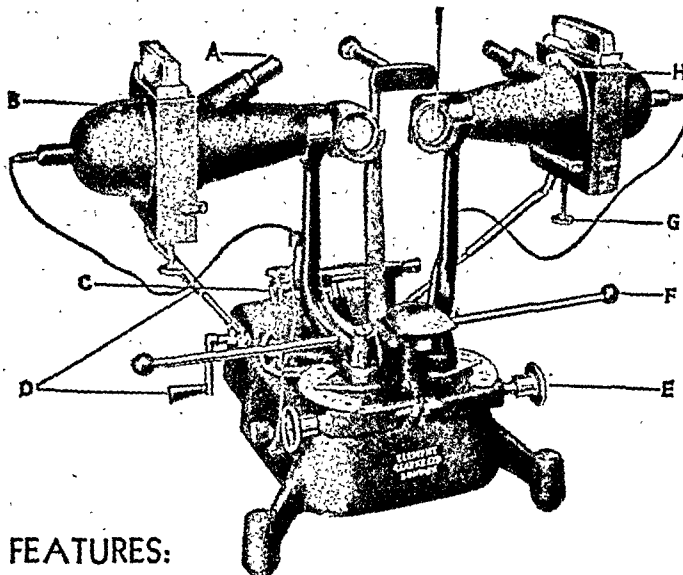
GOING !



FROM the first grade to the fifth—to high school and college—life would be difficult for some people if it weren't for optical science. A healthy life and normal progress demand that their visual abnormalities be corrected. We see the connecting link—the pathway to health and happiness for these people. *You* and the organization. *You* to judge condition of the eyes—the correction needed—and we translate your prescription into the tangible form—spectacles. . . . While the art of making spectacles originated with the ancients, the skill and precision of today are far superior to that of ten years ago. New improved products, modern equipment and skilled craftsmen, rich in experience, form a combination for modern quality spectacles that has never been equalled. It is this combination that is offered you and your patients through any one of our 70 offices—from Chicago to the Pacific Coast.

GGS OPTICAL COMPANY

SYNOPTOPHORE



THE STANDARD INSTRUMENT FOR THE DIAGNOSIS AND TRAINING OF OCULAR MUSCLE IMBALANCES. IN DAILY USE BY OPHTHALMIC SURGEONS AND ORTHOPTIC CLINICS IN ALL PARTS OF THE WORLD.

The co-ordinating device first introduced on the Synoptophore has been modified to incorporate a new reciprocal motion whereby the tubes may be converged or diverged either independently or simultaneously.

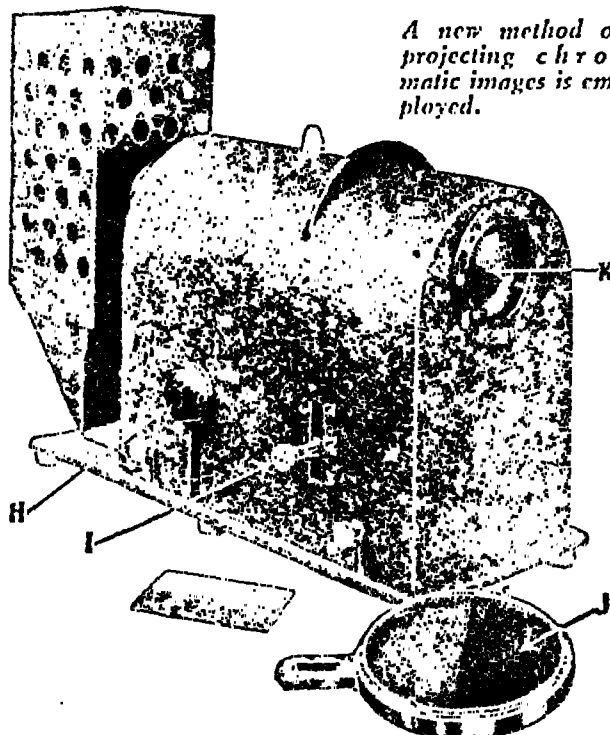
FEATURES:

- Absolute accuracy of measurement
- All controls under surgeon's command without disturbing patient
- Corneal reflexes easily seen
- Positive co-ordinating device
- Perfect and individual control of illumination
- Independent flashing device for breaking down suppression
- Slow motion device for fusion training
- Proved of consummate precision and longevity.*

It is now generally recognised that controlled exercises over the whole of the binocular field form a definite part of the treatment of strabismus and heterophoria. The kinetic principle of orthoptic training may also be applied in the reduction of asthenopia and improving ocular motility and muscular tone.

MYOSCOPE

A new method of projecting chromatic images is employed.



16, WIGMORE ST.
LONDON, ENG.
Cables: CLEMCLARKE
London, Bentley's Code

Shell Prosthesis Over Deformed or Shrunken Globe



ORDINARY SHELL—Note thickness of Glass at Cornea



IMPROVED THIN SHELL—Note Reduction in Thickness of Glass at Cornea



SINCE the introduction of contact lenses Oculists have realized the advantage of advising patients with deformed or shrunken globes to be fitted with improved thin shell eyes to overcome the deformity associated with these cases and to improve the cosmetic result.

Oculists are only now becoming "Contact Shell Conscious," realizing the tremendous economic importance of restoring cosmetic symmetry. Also to be considered is the psychological aspect of the patient on life as well as the economic aspect.

In the past Oculists hesitated to recommend such procedure in cases of deformed globes because of the fear of sympathetic ophthalmia, but in the experience of eminent Oculists and corroborated by our own experiences of over three-quarters of a century, this fear has been over-emphasized and the consensus of opinion now is that such danger is remote.

However, such cases are fitted only upon recommendation of Oculists.

The advantage of these thin shells is that the motion of the globe is identical with that of the sound eye and that no depression occurs under the upper lid in most cases.

MAGER & GOUGELMANN, Inc.

Eastern Division

NEW YORK
510 Madison Ave.

PHILADELPHIA
1930 Chestnut St.

BOSTON
230 Boylston St.

WASHINGTON, D.C.
207 Albee Bldg.

Western Division

CHICAGO
30 N. Michigan Ave.
CLEVELAND
913 Schofield Bldg.

DETROIT
805 Empire Bldg.
PITTSBURGH
803 May Bldg.

MILWAUKEE
710 N. Plankinton Ave.
ST. LOUIS
801 Metropolitan Bldg.

KANSAS CITY
1211 Rialto Bldg.
MINNEAPOLIS
325 Medical Arts Bldg.

WASHINGTON UNIVERSITY

School of Medicine

offers

A week's intensive training in

OPHTHALMOLOGY and OTOLARYNGOLOGY

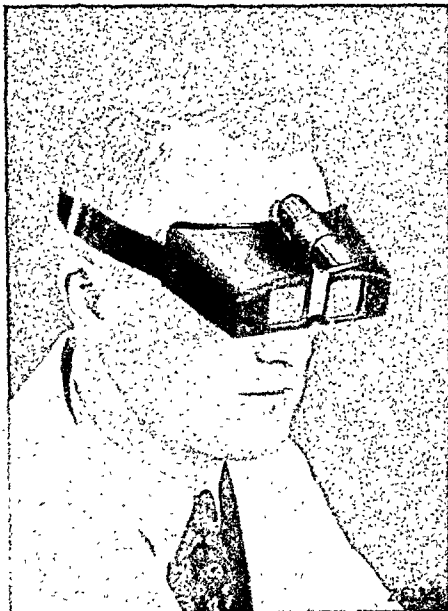
Only qualified ophthalmologists
and otolaryngologists will be
accepted for this course

The course begins March 2, 1936

For information, address

THE DEAN

Washington University School of Medicine
St. Louis, Missouri



ZEISS

BINOCULAR HEAD MAGNIFIER

Magnification 2.25x

Field of view 6"

Working distance 8"

Gives a stereoscopic image, free from distortion and clear to the margin of field. No focusing or adjustment required. Can be used with or without spectacles.

Price: Without Ill. Device \$12.00

With Ill. device & bulbs \$17.00

CARL ZEISS, INC.

485 Fifth Avenue
NEW YORK

728 So. Hill Street
LOS ANGELES



GILL MEMORIAL EYE, EAR AND THROAT HOSPITAL

presents its tenth Annual Spring Graduate Course in Ophthalmology, Otology, Rhinology, Laryngology, Facio-Maxillary Surgery, Bronchoscopy and Esophagoscopy, from April 6 to 11, 1936.

THE FACULTY

Guest Members

Dr. Wells P. Eagleton....Newark, N.J.	Dr. Robert H. Ivy.....Philadelphia, Pa.
Dr. Perry G. Goldsmith.....	Lr. Wendell L. Hughes..Hempstead, L.I.
.....Toronto, Canada	Dr. Meyer Wiener.....St. Louis, Mo.
Dr. John A. Kolmer...Philadelphia, Pa.	Dr. Walter I. Lillie...Philadelphia, Pa.
Dr. James A. Babbitt..Philadelphia, Pa.	Dr. J. Milton Griscom...Philadelphia, Pa.

Resident Members

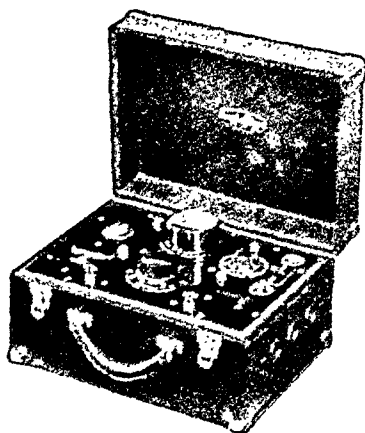
Dr. Elbyrne G. Gill.....Roanoke, Va.	Nathan RidgewayRoanoke, Va.
Dr. John A. Pilcher, Jr....Roanoke, Va.	Miss Eleanor Rozar.....Roanoke, Va.

For Further information address Superintendent

Gill Memorial Eye, Ear and Throat Hospital
Box 2467, Roanoke, Virginia

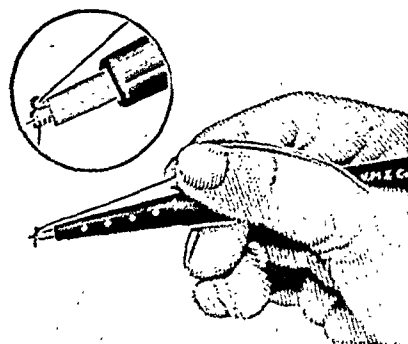
THE WALKER OPHTHALMIC HIGH FREQUENCY UNIT

for the treatment of retinal detachment



A distinguishing feature of the Walker Unit is its ability to produce an unprecedented minimum current volume with a wide enough latitude of control to assure accuracy of dosage. Entire control of current intensity is by one dial—by advancing or retarding this dial greater or lesser amounts of current are immediately available.

Small, compact, portable, absolutely safe, and easy to operate.



The illustration on the right shows the position of the bakelite handle in the hand with thread attached to the micro-pin and held between the thumb and index finger. Inset is an enlargement of the coil-like iridium platinum micro-pin with thread attached. Complete information sent on request.

V. MUELLER & CO.

Ogden Ave., Van Buren and Honore Sts., Chicago

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3, Vol. 19, No. 2

FEBRUARY, 1936

CONTENTS

Original Papers	Page
Headache. William H. Crisp	93
Sympathetic ophthalmia. Part II. Alan C. Woods	100
Scientific and practical considerations involved in the near-vision test with presentation of a practical and informative near-vision chart. James E. Lebensohn	110
Studies on the infectivity of trachoma. R. W. Harrison and L. A. Julianelle..	118
Lipodystrophia progressiva with ocular complications. J. W. Charles and M. Hayward Post	126
Ophthalmic errors. Hans Barkan	129
The relation of accommodation to the suppression of vision in one eye. Glenn A. Fry	135
The nonsurgical treatment of nonparalytic strabismus. Samuel V. Abraham..	139
Management of complications in the operation for senile cataract. Harry W. Woodruff	146
Notes, Cases, Instruments	
Remote point for visual-acuity tests. Frank G. Murphy	151
A combination loupe and head mirror. Conrad Berens	152
Society Proceedings	
College of Physicians of Philadelphia, Section on Ophthalmology, March, 1935	153
Chicago Ophthalmological Society, April 15, 1935	155
New England Ophthalmological Society, March 19, 1935	158
Editorials	
Contemporary critics of Graefe	159
Trachoma	161
Evaluation of clinical and laboratory findings	162
Book Notices	
Pacific Coast Oto-Ophthalmological Society, 1935	163
Correspondence	
To insure permanent detachment of the root of the iris in glaucoma operations	164
Abstract Department	
General methods of diagnosis; Therapeutics and operations; Physiologic optics, refraction, and color vision; Ocular movements; Conjunctiva; Cornea and sclera; Uveal tract, sympathetic disease and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeballs and orbit; Eyelids and lacrimal apparatus; Tumors; Injuries	165
News Items	192

The Optical Principle Underlying Orthogon Lenses—*Designed for Eyes that Move*

WHEN we attempt to correct the refractive condition of any eye which is not emmetropic, by means of a lens to be worn before it, we cannot hope to do more than to render the combination of the eye and the lens emmetropic, just as the perfect eye is emmetropic without a correction lens.

Optical science proves that this condition is fulfilled, no matter what the refractive error may be, when the principal focal point of the correction lens coincides with the far point of the eye. This applies in all cases, and is a most significant fact. If this fact covered the entire proposition, the task of designing a perfect correcting lens would be easy, indeed. It would be necessary only to determine the location of the far point of the eye, and put in place a lens the focal point of which coincides with the far point of the eye. Any lens of the right power would do.

However, the problem is complicated by the fact that the eye moves in its orbit, and as it moves, the line of vision moves; and the far point, the near point and the macula move also, turning about a center

at the middle of the eye. Now, the focal point of the correction lens should fall upon the far point of the eye, no matter where it turns. It is not enough to consider but one position of the far point, for in reality, the far point can rotate and, so, can occupy any position upon what is called the "far point sphere," an imaginary spherical surface the center of which is at the center of rotation of the eyeball.

To fulfill the requirement that the focal point of the lens should always fall at the far point of the eye, we must have either a lens that turns as the eye turns, or a stationary lens before the eye, with a focal point at every position which the eye's far point can occupy.

The first is impracticable, and the second cannot be fulfilled precisely. The nearest practical solution is found in the Orthogon Lens. Its scientifically correct design provides the same quality of vision, whether the eye looks through the center of the lens or through its edge.

Bausch & Lomb Optical Co., Rochester, N.Y.

HEADACHE

From the point of view of the ophthalmologist

WILLIAM H. CRISP, M.D.

DENVER

Headache is a symptom referable to many causes other than ocular. The most important of these are briefly discussed, among others increased intracranial tension, nasal accessory sinuses, gastrointestinal disorders, neurologic causes, fatigue, and allergy. Headache is directly due to eyestrain in a large percentage of cases. The paper does not lend itself to abstracting. Read before the American Academy of Ophthalmology and Otolaryngology, in Cincinnati, on September 17, 1935, as part of a symposium on this subject.

In what may appear to some as the golden age of medical science, is it perhaps somewhat strange that the subject chosen for a symposium should be a mere symptom, arising from a great variety of causes, yet whose precise nature and origin we do not understand? Who can accurately define pain? And who can accurately define headache, except by saying that it is pain in the head?

Pain may be thought of as Nature's warning that the sufferer is in danger from injury or disease. It provokes immediate withdrawal of the damaged or threatened bodily part from the source of danger, or in the case of disease it often serves to compel cessation of physical activity; in other words, to induce rest, which Hilton classically portrayed as the enemy of pain and disease. In functional gastrointestinal disorders it often contributes to the patient's recovery by persuading him to refrain from further ingestion of food.

Headache may occur in plethora, or it may occur in anemia. It may arise from increase of intracranial tension, or it may be provoked by a fall in intracranial tension, as after spinal puncture; although Gordon Holmes (quoted by Critchley and Ferguson¹) tells us that he has never known migraine to persist in a patient who had had a surgical or traumatic decompression. Headache may arise from excess of food in the gastrointestinal tract, or from an insufficiency. It is a symptom of most fevers, although I doubt whether

anyone has ever successfully explained why. To the ophthalmic physician it is significant as a product of eyestrain, yet many patients with plenty of cause for eyestrain proudly allege that they have never had a headache, do not know what headache means.

Opinion as to the exact seat of the pain in headache is almost as indefinite today as in the time of Galen (131-201 A.D.). In 1893, the question was reviewed historically by Harry Campbell² of London, who described headache as pain felt anywhere above the base of the skull.

Campbell argued that the aching structure might be "(1) the brain itself; (2) its membranes—the pia mater, arachnoid, and dura mater—these including the tentorium cerebelli, the falx cerebri and cerebelli, and the large fold of pia mater forming the velum interpositum; (3) the skull-bones and mucous membranes lining the frontal, ethmoid, sphenoid, and mastoid sinuses, and the middle ear; and, finally, (4) the structures covering the cranial vault, including the scalp, the skin of the forehead and temples, and all the tissues lying between these and the bone—viz., the pericranium and certain aponeuroses and muscles."

Since it is at best exceptional for a patient to be able to refer his condition to any one of the structures just listed, the patient's testimony as to the seat of the pain is obviously unreliable or useless.

The ancients agreed with modern

medical thought in excluding the brain as a seat of pain. Hippocrates seems to have expressed no definite opinion on the question. Galen's "highly speculative mind" thought the arteries and brain capable of sensibility, but looked upon the meninges and pericranium as the principal seats of headache.

It is interesting to note that Galen distinguishes external headache from internal pain "by the fact that the internal pain spreads to the roots of the eyes (that is the optic nerves), while the external one never does." His explanation of this supposed difference is that the tunics of the eyeballs are continuous with the cerebral meninges, such continuity facilitating transmission of the pain. This view was repeated, almost in Galen's own language, by writers of the sixteenth, seventeenth, and eighteenth centuries. Galen placed the pain in some cases of migraine in the temporal muscles.

Willis (1621-1675), to whom medical science acknowledges a large indebtedness for fundamental knowledge in nervous anatomy and physiology, and who believed that pain depended upon a "convulsion or corrugation of the nerves," declares that the parts affected by the pain of headache are "the two meninges and their various processes, the coats of the nerves, the pericranium . . . and other skinny membranes, the fleshy panicle of the muscle, and, lastly, the skin itself."

Seller (quoted by Campbell) mentions an opinion that the brain is devoid of sensation during health, but capable of becoming sensitive under certain morbid conditions, the sensibility being independent of nerves and altogether *sui generis*. Heberden (1710-1801), in his Commentaries, declares that headache appears to be seated in the brain itself.

Gowers (1845-1915), master neurologist and ophthalmoscopist, made the interesting clinical observation that hemiplegia due to syphilitic thrombosis was very frequently (in one half of his cases) preceded for days or even months by headache, and he remarks that the pain in these cases is "apparently in some way due to the arterial disease itself"; but he does not commit

himself to the opinion that it is actually located in the arteries.

As already hinted, the importance of headache for the ophthalmologist lies in the fact that a large proportion of his patients come to him for relief from that particular symptom. Estimates as to the percentage of cases of headache wholly or partly due to eyestrain have varied from 50 to 90 or more. Headache is common even in young children. Many years ago Treichler stated that one third of the children attending school in France and Germany suffered from headache.

Headaches attributed to eyestrain are sometimes due to entirely different causes, and it is equally true that headaches attributed to other factors are often relieved by correction of eyestrain. Thus, eye physicians must be prepared to arrive at a preliminary decision as to whether the headache which the patient describes may be or probably is due to eyestrain; but the eye physician must also know enough about other possible causes of headache to be able to suspect such causes either as acting independently and being responsible for a headache in which eyestrain has no part, or, perhaps more frequently, as conspiring with eyestrain to produce the symptomatic result.

For it must not be forgotten that headache, like some other symptoms, is more likely to occur in the presence of several causes than in the presence of only one cause.

Attempts are often made to decide whether or not we are dealing with an eyestrain headache by its location or by the time of day at which the headache occurs. As very characteristic of eyestrain we include especially frontal and parietal headaches or an ache occurring in and around the eyeball itself. But occipital and nuchal pains are frequently symptoms of eyestrain, and at times eyestrain leads the patient to complain of pain as low down as between the shoulder blades, which of course can hardly be thought of as a headache and yet is closely related to it.

Usually headache is most typically attributable to eyestrain when it comes on during close use of the eyes, or during such distant use of the eyes as in

driving, looking out of a train window, or watching a theatrical performance. A child may develop headache after an hour or two in school and especially during classes which demand close use of the eyes.

If a headache is experienced on rising in the morning, or even during the night, we are a little more apt to be skeptical as to its ocular relationship. Yet many of us have seen patients in whom nocturnal or early morning headache was definitely traceable to strain put upon the eyes during the late hours of the previous day.

The oculist and the otolaryngologist often play a sort of game of "I spy," in which now one scores and now the other. The patient who has been fitted with several pairs of glasses, all pretty much alike, may some day drop in on his oculist with the remark "Dr. Rhino cured my headache right off by washing out my antrum." A week later the oculist may score by giving prompt relief to a patient who has been subjected to nasal packs for a month or so. The great principle of the game, if you play it warily, is to preserve an open mind, and to know a good deal about the other fellow's specialty as well as your own.

Another specialty with which the ophthalmologist needs to have distinctly more than a nodding acquaintance is that of the neurologist. Otherwise he might make the mistake of assuming that an encephalitis developing after German measles was merely an indication for prescribing glasses. It is significant that some of the greatest writers on ophthalmoscopy have been neurologists, and it is a pity that not every ophthalmologist's training has included at least several months in a neurologic clinic or hospital.

The need of at least a year of intimate contact with the practice of general medicine before entering the restricted field of ophthalmology becomes more evident when we remember that the ophthalmologist may be the first physician consulted by a patient who is suffering from nephritis or intracranial tumor or one of the slower forms of meningitis. In a patient who has been under treatment for tuberculosis it is

not always easy to arrive at a downright conclusion as to whether headache is due to general toxemia, eyestrain, or a meningeal complication. A patient's cerebral arteriosclerosis may have more—or less—to do with his discomfort than does the inadequacy of his refractive correction.

It is a very essential commonplace to say that we are often called upon to treat the patient rather than his symptoms. Headache may arise purely from general fatigue, although even more frequently from general fatigue in combination with eyestrain. It may not be amiss here to remind nonophthalmologists that excellent vision does not demonstrate freedom from eyestrain, since the worst sufferers from headache often show so-called normal visual acuity without glasses and are relieved by a hyperopic or astigmatic correction which does not materially change their visual power.

Quite commonly we are taught that the myopic or short-sighted patient does not experience headache. There is some truth in this, but also some error. I have found a number of slightly myopic patients whose headaches were relieved upon correction of the myopia. I have no completely satisfactory explanation for this manifestation. In the presence of a low myopia affecting equally both eyes, use of the accommodation can hardly be a factor. But many of these patients resort to contraction of the muscles of the eyelids in the attempt to sharpen distant vision, and this I believe explains the headache or other symptoms of strain which they experience. A myopic patient may of course be subjected to eyestrain if his two eyes are unequal in focus or if the myopia is complicated by appreciable astigmatism.

The refractionist who habitually undercorrects hyperopia needs to be reminded that many headache victims can only obtain relief by patiently learning to wear a full correction, and that the full correction even as found under cycloplegia is most emphatically called for in this type of patient.

Headaches and some more remote symptoms of eyestrain bring us into the interesting field of referred pain. A pa-

tient with uncorrected hyperopia or astigmatism, or with an improper correction, may be subject to frequent attacks of "indigestion"—nausea and even vomiting, often but not always associated with headache. Other referred or reflex symptoms which may occur in association with headache or may occur independently are dizziness, loss of the power of concentration, and various queer head sensations which each patient describes in his own peculiar way.

As Tilley³ has reminded us, nerve sensations affecting the face and scalp are reflected into the gasserian ganglion and the pons, to be further distributed over an extensive area of brain stem from the level of the corpora quadrigemina to the upper cervical region of the spinal cord; and these nerve impulses find numerous interrelationships with the nuclei of origin of all the other cranial nerves. It must be equally true that nerve impulses from these remote regions are occasionally reflected to the head. The interrelationship between the head and face and the digestive apparatus is particularly intimate, because the sensory root of the fifth nerve lies in close approximation to the root of the vagus nerve in the floor of the fourth ventricle.

Those of our remote ancestors who underwent primitive operations for trephining of the calvarium must have experienced headache as a prominent symptom; yet it is barely mentioned in volumes on the history of medicine.

Headache as a symptom arising from disease of the nasal accessory sinuses is too large a subject to be dealt with in detail here.* In the interpretation of headache, the importance of the nasal sinuses for the ophthalmologist lies in the facts that they may produce headache, that they may even produce a headache which simulates ocular headache, that a headache thought to be due to the sinuses may actually be ocular, and that both the eye and the nasal sinuses may share the responsibility for headache.

When the ophthalmologist has done

his best in the correction of a refractive error which seems important, the patient's failure to obtain relief may be due to faulty habits in reading. In many patients excessively rapid reading is productive of cerebral fatigue which may translate itself into general exhaustion and inhibition of digestive function. In children, a sincere attempt to study homework in the evening in spite of distraction by the radio and other disturbances may cause headache and brain fag beside interfering with the intellectual result. On the other hand, steady deliberate work without distractions is not infrequently followed by a sense of restfulness and mental repose. The range or angle at which the book is placed before the eyes, the relative height of the patient and of the table or desk upon which a book is placed or writing is carried on, the question whether study or reading too promptly follows ingestion of a heavy meal, may all have to be considered as supplemental factors.

Headache may arise from irregularities in diet or disorders of digestion. In this connection we may find ourselves confronted with problems relating to chronic gastrointestinal disease, of excessive intake of food, of allergic reaction, or of miscellaneous dietetic indiscretions. The question whether the patient partakes injuriously of alcohol or tobacco must not be overlooked.

Every physician, including the eye physician, must remember the importance of fatigue in producing digestive disturbances. In his classical observations on the stomach of Alexis St. Martin through a traumatic fistula, Beaumont records that in "fear, anger, or whatever depresses or disturbs the nervous system, the villous coat of the stomach becomes sometimes red and dry, at other times pale and moist, and loses its smooth and healthy appearance; the secretions become vitiated, greatly diminished, or entirely suppressed." On the other hand a regurgitation of bile into the stomach was precipitated when St. Martin became very angry. Alvarez⁴ suggests that just as sensitive persons blanch and blush externally, so also they may perhaps blanch and blush internally.

* In the symposium, referred to in the abstract, Dr. Derrick T. Vail's paper dealt with this phase of the subject.

Many essays, and a few more extensive monographs, have been written on the subject of headache. Some of these have assembled interesting examples of the influence of headache upon the careers of scientists, artists, and distinguished authors.

It seems probable that Charles Darwin was a victim of uncorrected eyestrain, although the exhaustion which he experienced after facing an audience may have been largely emotional.

Sir Isaac Newton was compelled by headache to abandon his laborious studies on the theory of lunar irregularities; and he states that "his head had never ached but when studying that subject" (quoted in a monograph by Wright⁵ on headache). In this case the pain may have been due merely to excessive use of a brain which was threatened with disease.

One of the most famous of English literary critics of the last century, and perhaps the greatest student of the Renaissance period of Italian art, was John Addington Symonds the younger, clearly a victim of chronic tuberculosis, and ultimately dying from the complications of that disease, who suffered greatly from headache and other symptoms in which eyestrain probably played an important part. He is the subject of one of George M. Gould's "Biographic Clinics."⁶ Gould, who indignantlly rejected the title of "crank," showed his usual extravagance of viewpoint by attributing Symond's tuberculosis to his eyestrain.

It may be that the younger Symonds's headaches, which were treated for some time by his father, John Addington Symonds, Sr., had something to do with the fact that the latter selected headache as the subject of an excellent monograph, which he delivered before the Royal College of Physicians as the Gulstonian Lectures for 1858.⁷ Perhaps the elder Symonds has his son's obstinate affliction in mind when he says: "Put all the breast-pains, stomach-pains, and colic-pains together, and you do not make such an aggregate of suffering as is furnished by headache"; and again when he describes the common headache as "that torment to the individual and pest of society,

which so often interrupts the daily occupation, spoils the arrangements of social life, and drives the sufferer to the domestic medicine chest, and thence to the family practitioner and the medical celebrities of the day; while but too often, from their baffled science and art, the patient flies frantic with disappointment to a series of quackeries, ending in greater disappointment, because beginning with more extravagant expectation." Probably Symonds again had his son in mind when he described nervous headaches as occurring in "persons of very lively emotions and delicate sensibility . . . among those who have the aesthetical and imaginative elements highly developed . . . the frequent accompaniment and curse of high intellectual endowments," especially "when the functional activity of the brain, whether in perception, emotion, or intellect, is disproportionate to the organic vigour of the rest of the body."

There can be no question that many lives have been ruined by manifestations of uncorrected eyestrain, especially in the form of headache. Too often this fact is overlooked by careless refractionists. George M. Gould, on the other hand, allowed himself to be carried away by an excess of enthusiasm. In his *Biographic Clinics* (published over a period of seven years) he traced to eyestrain, frequently with headache as a leading symptom, the ill health of De Quincey, Carlyle, Charles Darwin, Thomas Huxley, Robert Browning, John Addington Symonds, George Eliot, Herbert Spencer, James Greenleaf Whittier, Hippolyte Taine, Honoré Balzac, Tschaikovsky, Flaubert, Jonathan Swift, and others. These essays are readable and suggestive but must be accepted with the proverbial grain of salt.

It was Gould who at first estimated that 90 to 95 percent of cases of migraine were due to eyestrain and correctable with glasses, and who subsequently raised this estimate to 99 percent!

As regards migraine, a wiser conclusion is represented by the opinion of a group of leaders in refraction, quoted by Gould, who assented to the following: "I believe that sick headache often

depends on eyestrain, and I have known cases that were cured by ocular treatment."

When every possible consideration as to etiology has been explored and every therapeutic measure tried, it is likely that, as regards many of its victims, migraine will still remain a mystery, will still present unconquerable barriers. In the words of Critchley and Ferguson,¹ migraine "has been the happy hunting ground of the theorist, and the problem has been attacked by representatives of all branches of medicine. Each in turn has discovered in migraine phenomena pertaining to his own specialty; each in turn has hit upon the true nature of the malady; in turn, each has found the infallible remedy."

The ophthalmic physician must at all times be willing to coöperate to the utmost in the attempt to relieve the migraine subject; but he must also recognize that the cause may lie in other fields than his own, and also that cure may be impossible.

Although migraine is ordinarily regarded as "a paroxysmal affection comprising severe unilateral headache, preceded by visual phenomena and followed by nausea and vomiting," Critchley and Ferguson argue that any one or even any two of these classical symptoms may be absent and the diagnosis of migraine still hold good. Thus, according to these authors, the essential disorder may be manifested merely by the disturbance of vision (scintillating scotoma, teichopsia), by the occurrence of paroxysmal headache, or by nausea and vomiting. Usually unilateral, the headache may lack this characteristic and still be migrainous in origin.

In recent years, an interesting addition to the possible causes of migraine, and also to other forms of headache, has been offered by the allergists, and the possibility of allergy as a basis for the disorder must be frankly recognized by the progressive ophthalmologist. It may be true, as Critchley and Ferguson declare, and as Alvarez is evidently also disposed to consider, that the case for the allergic nature of migraine has been overstated. Yet there is most convincing evidence that in some cases, at least, the migrainous attack is pro-

voked by reaction to a foreign protein. Balyeat and Brittain² go so far as to say that the exciting factor in migraine is probably always a specific sensitivity to one or more foreign proteins, although there may be many predisposing factors.

In its bearing on the complexity of the problem of allergic migraine, the following comment by Balyeat and Brittain seems worthy of reproduction here: "Practically all investigators give heredity as the most potent factor in the production of migraine. It need not be assumed, as is frequently believed, that the hereditary factor must be migraine itself. . . . It is only one of a number of symptom complexes which are metamorphosed in passing from parent to offspring and arise in different forms in different members of a family. For example, five children in one family might be specifically sensitive to wheat. From such a sensitivity asthmatic symptoms might appear in the first child, eczema in the second, hay fever in the third, urticaria in the fourth, and migraine in the fifth. . . . The type of sensitivity from which the antecedent suffers has no relation to the type the descendent may have." In the series of migraine patients studied by Balyeat and Brittain, a positive family history of allergy was elicited in 47, or 85.4 percent, while there was a family history of migraine in only 25, or 45.4 percent.

Rowe,³ who feels that every case of migraine should be studied with the possibility of food allergy in mind, makes the following observations: "Many discussions of migraine, even today, lay most emphasis on neurosis as a cause. It is true that many of these sufferers are introspective, analytical, and neurotic. This is due in large measure, however, to their continued effort at self-help since all types of medical treatment have been of little benefit in the past."

Rowe believes that migraine resulting from food allergy is "due to a localized swelling or vascular spasm in the brain. Pain in some cases in the literature," he says, "has been so severe as to suggest brain tumor, and exploration has revealed angioneurotic edema of

the brain itself. . . . Such localized edemas would explain the transient amblyopia, aphasia, paresis, or paresthesia which have been described as complications of migraine for many decades."

Unfortunately, investigation as to substances to which the patient is allergic is expensive and often lacks finality. In addition to the relatively simple scratch tests, intradermal and patch tests and the use of elimination diets are recommended. Quoting from Hinant:¹⁰ "Probably the laboratory procedure of greatest value in cases of food allergy is the leucopenic index of Vaughan which is based on the principle of hemoclastic crisis as pointed out by Widal, Abrami, and Iancovesco in 1920. The ingestion of foods in normal patients produces a mild leucocytosis. In patients with food allergy, the ingestion of foods to which the patient is sensitive produces a marked leucopenia. Through this simple laboratory procedure, offending foods have been discovered when skin tests, elimination diets, and the food diary have failed. In the experience of Vaughan and other workers, this test has been from 90 to 100 percent accurate."

Although nervous headaches may occur in people whom we do not ordinarily regard as nervous, the victims are often of the type which expends nerve energy excessively in the course of the routine of even a normal day.

When we talk of emotions and their disturbing influence upon bodily functions, we are a little too apt to think exclusively of the major and more obvious emotions of anger, fear, grief, or even joy. But many excellent people, in the course of an ordinary psychologic day, go through a multitude of petty emotional upsets—irritation over what someone else or even the individual himself has done, humiliating incidents hardly recognized as such at the moment and later forgotten, disappointment, eagerness, apprehension, the

sense of irksomeness of duties uncompleted, perplexity, suspense, the tension of responsibility, difficulty of concentration in the presence of distractions. It may be said that some persons live almost continually in a state of suppressed excitement, and the possibilities for resulting fatigue of the whole nervous system are readily understood.

The inveterate kindness of Dr. Oliver Wendell Holmes, displayed alike in his miscellaneous writings and in his medical essays, stands in contrast with his frank recognition of the type of hopeless patient described in the following quotation from his valedictory address, in 1871, to the graduating class of Bellevue Hospital College¹¹: "What I call a good patient is one who, having found a good physician, sticks to him till he dies. But there are many very good people who are not what I call good patients. I was once requested to call on a lady suffering from nervous and other symptoms. It came out in the preliminary conversational skirmish, half medical, half social, that I was the twenty-sixth member of the faculty into whose arms, professionally speaking, she had successively thrown herself. Not being a believer in such a rapid rotation of scientific crops, I gently deposited the burden, commending it to the care of number 27, and him, whoever he might be, to the care of Heaven."

In conclusion it may be said that, while the ophthalmologist must neither belittle nor neglect his own possibilities for helpfulness, and must at the same time recognize a variety of possibilities of coöperation by other physicians, he must in the end be also ready to accept the fact that there are patients who cannot be cured, because it is impossible to obtain their coöperation, either from lack of will or from sheer lack of the necessary mental balance in the patient himself.

530 Metropolitan Building.

References

- ¹ Critchley, M., and Ferguson, F. R. Migraine. *The Lancet*, 1933, v. 1, pp. 123 and 182.
- ² Campbell, Harry. What constitutes the aching structure in headache? *The Lancet*, 1893, v. 2, July 22, p. 184.
- ³ Tilley, Herbert. Headache and pain in inflammation of nasal sinuses. *Brit. Med. Jour.*, 1933, v. 1, April 1, p. 549.

- ⁴ Alvarez, W. C. *Nervous indigestion*. New York, Paul B. Hoeber, Inc., 1930.
- ⁵ Wright, M. G. *Headaches, their causes and their cure*. London, J. and A. Churchill, 1879.
- ⁶ Gould, G. M. *Biographic Clinics*. Philadelphia, P. Blakiston's Son and Co.
- ⁷ Symonds, J. A., Sr. *On headache*. *Gulstonian Lectures for 1858*. *Med. Times and Gaz.*, 1858, v. 16, pp. 285, 339, 393, 419, 471, 495.
- ⁸ Balyeat R. M., and Brittain, F. L. *Allergic migraine*. *Amer. Jour. Med. Sciences*, 1930, v. 180, Aug., p. 212.
- ⁹ Rowe, A. H. *Allergic toxemia and migraine due to food allergy*. *California and Western Med.*, 1930, v. 33, Nov., p. 785.
- ¹⁰ Hinnant, I. M. *Headache of allergic origin*. *Cleveland Clinic Quarterly*, 1935, v. 2, July, p. 72.
- ¹¹ Holmes, O. W. *Medical Essays (1842-1882)*. Boston and New York, Houghton, Mifflin and Co.

SYMPATHETIC OPHTHALMIA

Part II

ALAN C. WOODS, M.D.
BALTIMORE

This is the second part of a paper on this subject by the author. Part I appeared in the issue of January, 1936. Part II deals with the pathology and prophylaxis of the disease with statistics as to the outcome of treatment from the reports of Post, Verhoeff, Woods, and Joy. This paper was delivered as a lecture at the Graduate School of Ophthalmology at the University of Rochester, New York, on July 29, 1935. From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

Pathology of Sympathetic Ophthalmia

The almost routine procedure of enucleating the exciting eye of patients with sympathetic ophthalmia has afforded a wealth of material for the study of the pathology of the disease. While comparatively few sympathizing eyes, only those enucleated for pain or obtained at autopsy, are available for study, there has been sufficient material studied to demonstrate clearly that both the exciting and sympathizing eyes show exactly the same underlying histological picture.

The pathology of sympathetic ophthalmia was studied extensively by numerous early observers. In 1905, Fuchs published his classical paper in which he described in detail the full pathology of the disease, and emphasized its salient and diagnostic characteristics. Since this paper there has been little added to the picture. The subject has in late years been studied extensively by Samuels.

The essential pathology of sympathetic ophthalmia is an infiltration of the uveal tract, especially of the choroid (fig. 1). This infiltration is character-

ized by round-cell infiltration, with masses of epithelioid cells and giant cells. The epithelioid cells are larger than the lymphocytes, have an oval, vesicular nucleus, and a large eosin-staining protoplasm. They are probably derived from the monocytic wandering cells or from proliferation of the endothelial cells of the blood vessels. The giant cells are formed by the coalescence of the epithelioid cells, which merge, lose their cell outlines, and therefore show multiple nuclei. The giant cells should not be regarded as an essential characteristic of sympathetic ophthalmia, but rather as evidence of the chronicity of the disease (fig. 2).

There is a remarkable absence of exudates on the surface of the uveal tract. The presence of cyclitic membranes, so commonly observed in the exciting eyes, should be regarded as the result of the preceding traumatic iridocyclitis or endophthalmitis to which these eyes have been subject (fig. 3). The dense membranes sometimes encountered over the lens in sympathizing eyes are usually the result of the sympathetic infiltration breaking through the degenerated pigment epi-

thelium of the iris, rather than the result of an ordinary inflammatory exudate.

The infiltration of the choroid appears to start with a round-cell infiltration, chiefly around the larger veins in the external layers of the choroid. This cellular infiltration tends to be nodal in character, and epithelioid and giant cells appear. The infiltration spreads rapidly through the outer layers of the choroid, interspersed with masses of epithelioid cells in the center of which

which phagocytose the liberated pigment. These nodules of proliferating pigment epithelium with pigment phagocytosis are known as Dalen-Fuchs nodules (figs. 4 and 5).

Large, tumorlike masses of cells may form in the posterior layers of the iris, giving the clinical picture of iris nodules already mentioned. The anterior layers of the iris are usually free and sharply outlined. The cell masses in the posterior layer may break through the disintegrating pigment epithelium,

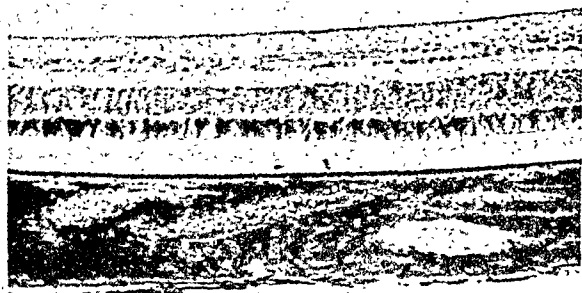


Fig. 1

Fig. 1 (Woods). Choroid and retina in sympathetic ophthalmia.



Fig. 2

Fig. 2 (Woods). Choroid in sympathetic ophthalmia. Epithelioid and giant cells.

giant cells are found. The choroid may become three to four times, or more, its normal thickness. The inner layers, especially the choriocapillaris, although involved, remain relatively free.

A rather characteristic change takes place in the pigment epithelium—the formation of the “Dalen-Fuchs” nodules. In long-standing detachments of the retina, small foci of proliferation, with no inflammatory reaction, form in the pigment epithelium. These normally undergo hyalin degeneration and are the well-known Drusen bodies. In sympathetic ophthalmia, however, these nodules of proliferating pigment epithelium undergo autolysis and are invaded by epithelioid and giant cells

and spread out over the anterior surface of the lens, forming the characteristic posterior synechiae with the clinical appearance of confluence of the iris and anterior lens capsule. In the latter stages of the disease this cellular infiltration of the choroid may disappear and be replaced by a shrunken layer of pigmented connective tissue.

The sclera is often attacked by a spread of this characteristic infiltration. Masses and layers of closely packed cells may infiltrate and split the inner layers of the sclera, especially at the limbus near the root of the iris. This infiltration appears to spread by way of extensions of the uveal tissue that line the emissary veins. It may spread



Fig. 3



Fig. 4



Fig. 5

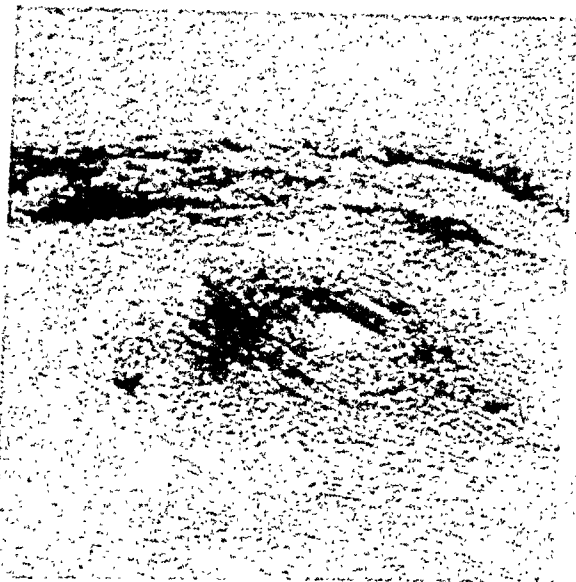


Fig. 6

Fig. 3 (Woods). Sympathetic ophthalmia, exciting eye. Nonspecific traumatic exudate and specific sympathetic infiltration.

Fig. 4 (Woods). Dalen-Fuchs nodule in sympathetic ophthalmia—low power (after Friedenwald).

Fig. 5 (Woods). The same as in figure 4, under high power. Pigment phagocytosis (after Friedenwald).

Fig. 6 (Woods). Sympathetic ophthalmia. Infiltration around perforating vessels of sclera.

out from the emissary veins to the middle layers of the sclera, and even in the external layers of the sclera characteristic nodules may appear about the openings of the emissary veins (fig. 6). Occasionally characteristic nodules have been observed back in the intra-

vaginal space, in the nerve tissue itself, and even between the fibers of the oblique muscles—extension of the uveal inflammation.

The cornea remains free of specific inflammation, participating only secondarily with cellular deposits on the pos-

terior surface, and secondary interstitial edema. The retina likewise remains relatively free, showing at most a round-cell infiltration about the walls of the blood vessels. The vitreous is usually affected and may even be destroyed.

The pathological picture of sympathetic ophthalmia closely resembles that of ocular tuberculosis. The following differential points may be stressed. (1) The infiltration about the emissary veins occurs characteristically early in sympathetic ophthalmia and occurs rarely in tuberculosis, and only in its late stages. (2) The general tendency in sympathetic ophthalmia is to a general uniform infiltration of the whole uveal tract, while in tuberculosis the infiltration tends to be focal and nodular. (3) Sympathetic ophthalmia attacks the posterior layers of the iris, with the formation of complete annular synechiae. Tuberculosis tends to attack the anterior layers, and interferes little with the motility of the iris. (4) In sympathetic ophthalmia the characteristic infiltration spreads to the other ocular tissues only along the extension of the uveal tissue and, while it invades, it shows no tendency to destroy the surrounding tissues, while tuberculosis tends to destroy the surrounding tissues by caseation and necrosis. (5) In sympathetic ophthalmia, even in the early stages, we find phagocytosis of the pigment granules by the epithelioid and giant cells. In tuberculosis we find this pigment phagocytosis only rarely, and then in the late stage of caseation and necrosis.

Blood Changes

In 1910, certain English observers (Ormond; Jones and Browning) reported that in several cases of sympathetic ophthalmia they had observed an increase in the small mononuclear cells in the circulating blood. This phenomenon has since been studied extensively, especially in England, in the hope that it might be an early diagnostic sign. Suffice it to say, that while many patients with sympathetic ophthalmia undoubtedly do show an increase in the mononuclears up to 30 percent, this in-

crease is not constant, and a similar increase may be found in patients with other forms of uveitis. It cannot, therefore, be regarded as a diagnostic nor prognostic sign of any importance.

Prophylaxis

The one recognized and proved preventive for sympathetic ophthalmia is the early enucleation of the injured eye—before it undergoes the characteristic pathologic changes. Even after the characteristic infiltration appears in the exciting eye, if the disease has not already attacked the second eye, enucleation may often protect the second eye against sympathetic ophthalmia. The development of this idea of prophylactic enucleation is interesting.

In his description of sympathetic ophthalmia in 1840, MacKenzie refers to Wardop, who had noted a somewhat similar uveitis in horses, affecting first one and later the second eye. The ocular disease was characterized by repeated exacerbations leading ultimately to blindness. Doubtless he was referring to periodic ophthalmia. The veterinarians at that time noticed that if one eye was destroyed or phthisical, the second eye was not attacked. They therefore adopted the idea of destroying the first eye in order to protect the other. Wardop tried this in horses and was so impressed by the results that he suggested it be tried on human beings. The idea was adopted and urged by other British surgeons, and by the time of Critchett's paper in 1863, enucleation of the exciting eye was an established procedure.

Enucleation of the exciting eye, even before the development of symptoms in the second eye, cannot be regarded as an absolute preventive or guarantee against the later development of sympathetic ophthalmia. Schick collected 80 cases in which sympathetic ophthalmia developed after enucleation of the exciting eye. In the cases of sympathetic ophthalmia reported by Fuchs, Joy, Verhoeff,² and Woods, there are 13 cases of sympathetic disease which developed after enucleation of the exciting eye. These cases are shown in table 4. In the six such patients re-

ported by Joy, sympathetic ophthalmia developed less than two weeks after enucleation of the exciting eye in three instances, and from one to two months after in the other three instances. In the seven such patients in the series of Verhoeff and Woods, the sympathetic disease developed within two weeks after enucleation of the exciting eye. Certainly, therefore, sympathetic ophthalmia is a very real danger for two weeks after enucleation of the injured, exciting eye, and Joy's figures indicate that it may be feared for as long a period as two months.

months after injury. At the time of enucleation the second eye showed only the slightest signs of early uveitis. The enucleated eye showed definite foci of sympathetic infiltration, but the second eye cleared immediately after enucleation, and there have been no recurrences of the uveitis. The converse of Dor's statement, however, is undoubtedly true. Enucleation within two weeks after injury is almost a certain preventive against sympathetic ophthalmia. In the 136 cases in the series of Fuchs, Joy, Verhoeff,* and Woods, there is only one instance of sympa-

Table 4

SYMPATHETIC OPHTHALMIA AFTER ENUCLEATION OF EXCITING EYE

Author	No. of Cases	Percentage of his Total	Interval Between Injury and Enucleation	Interval Between Enucleation and Outbreak of Sympathetic Ophthalmia
Fuchs	0			
Joy	6	14.6	14 days 26 days 27 days 3 months 5 months 48 years	4 weeks 2 days 2 weeks 2 months 1 month 9 days
Verhoeff	3	8.6	4 weeks 6 weeks 3 weeks	1 week 2 weeks 1 week
Woods	4	14.3	18 days 28 days 90 days 2 years	8 days 5 days 9 days 3 days

L. Dor believes that if enucleation of the exciting eye is too long delayed, the maximum allowable interval being two weeks, the prophylactic effect of enucleation is lost. Complete agreement with this view cannot be given. We have no way of knowing what eyes may ultimately become exciting eyes. Certainly eyes have been enucleated at much later intervals after injury, and have shown, on histological examination, the earliest possible sympathetic change. Sympathetic ophthalmia did not always progress in the second eye after such delayed enucleations. There is one such case in the author's series in which a lost eye was removed three

months after injury. At the time of enucleation the second eye showed only the slightest signs of early uveitis. The enucleated eye showed definite foci of sympathetic infiltration, but the second eye cleared immediately after enucleation, and there have been no recurrences of the uveitis. The converse of Dor's statement, however, is undoubtedly true. Enucleation within two weeks after injury is almost a certain preventive against sympathetic ophthalmia. In the 136 cases in the series of Fuchs, Joy, Verhoeff,* and Woods, there is only one instance of sympa-

thetic ophthalmia developing when the exciting eye had been enucleated within two weeks after injury. This case is in Joy's series. The enucleation was done 14 days after injury and the enucleated eye showed definite early sympathetic changes. Two weeks later, the second eye developed a mild sympathetic ophthalmia, with rapid recovery and normal vision. These figures indicate that enucleation within 14 days after injury protects the second eye against the outbreak of sympathetic disease.

It is generally believed that enucleation of the exciting eye after the onset of sympathetic ophthalmia in the second eye is a valueless procedure and is

not indicated, especially since it is possible that the exciting eye may ultimately have the better vision. If the disease is well advanced in the second eye this is doubtless true. But if the disease is in the incipient stage, it is not so certain. Joy believes, from a study of his collected cases, that better end results were observed in patients whose exciting eye was enucleated than in those in whom it was not done. His figures on this point, however, are not convincing, for the difference in end results is not great, and it is not clear just when the enucleations were done. In the author's series there are at least three cases in which the enucleation was performed in the first few days after the initial symptoms had appeared in the second eye. In all these patients the end result was excellent. Certainly, if the exciting eye is blind, or nearly so, it should be enucleated in all early cases of sympathetic ophthalmia.

Treatment

The one essential aim of local treatment is dilatation of the pupil to prevent pupillary occlusion. With the onset of sympathetic infiltration of the iris, complete posterior annular synechiae form rapidly, and thereafter dilatation of the pupil is virtually impossible. Therefore, in the early stages of the disease every effort must be made to obtain the maximum mydriasis. Instillation of atropine in the conjunctival sac and the daily subconjunctival injection of a solution of atropine and cocaine and of epinephrine bitartrate are the most valuable procedures. As soon as maximum mydriasis has been achieved, whatever the degree may be, only sufficient mydriatic should be used to maintain the dilatation obtained. If posterior synechiae have formed, and it is apparent that mydriatics have no effect, they should be discontinued, for their further use as a therapeutic agent is valueless, can only irritate the eye, and may frequently produce an atropine sensitivity.

The local application of heat is not of great value. The disease affects primarily the choroid and posterior ocular segments. Heat applied to the eye has no effect beyond the iris. The use of

deep heat by diathermy has been employed, but there is little evidence that it is of value. Other local procedures, such as subconjunctival injections of mercuric salts, are not indicated. They tend only to irritate the eye and have no effect on the underlying sympathetic inflammation.

A great number of general procedures have been advocated in the treatment of sympathetic ophthalmia. The most valuable single drug is undoubtedly sodium salicylate. H. Gifford advocated a daily dose of one grain per pound of body weight in divided doses with sodium bicarbonate, and today this treatment is an established procedure of undoubted value. Gifford^b also suggested the use of atophan as a substitute if sodium salicylates were badly tolerated. This, however, is definitely contraindicated by our modern knowledge of its deleterious effect on the liver. If nausea and general systemic reactions make the use of sodium salicylate impossible, aspirin is probably the best individual substitute. Salicylates may be used intravenously in the event of gastric reaction alone.

Jones and Browning have advocated the use of intravenous arsenicals in sympathetic ophthalmia. On the basis of the lymphocytosis so frequently found in these patients, they believed the disease might be caused by some protozoa, and that arsenicals would therefore be of value. There are a number of reports on the use of arsenicals in the disease, but the results are conflicting, some authors reporting improvement in the local picture, with no effect on the recurrence, while other reports indicate that the use of arsenicals is of no value whatsoever.

Nonspecific protein therapy is a recognized procedure of definite value in the treatment of sympathetic disease. The most valuable individual nonspecific agent is undoubtedly diphtheria antitoxin. This has been employed extensively by Verhoeff^b in the treatment of a large series of sympathetic-ophthalmia patients. The considerations that led to the early employment of diphtheria antitoxin were: "First, that horses were not subject to sympathetic uveitis and hence their serum might be

antagonistic to the disease; second, the serum of a horse immunized to diphtheria antitoxin probably contained enhanced nonspecific factors of immunity; third, that it was remotely possible that the antitoxin itself might be antagonistic to the disease; and fourth, that the serum might act as an anti-anaphylactic, in case the anaphylactic theory of the disease were true."

In practice it is customary to determine first whether or not the patient is sensitive to the antitoxin. This is done by preliminary intracutaneous injection of one drop of the material. If a positive intracutaneous reaction results, desensitization is accomplished by the intramuscular injection of 0.1 c.c., 0.2 c.c., 0.5 c.c., 1 c.c., 2 c.c., and 5 c.c. of the material at intervals of 15 minutes. At the completion of this course of desensitization, the remainder of 20,000 units of antitoxin is given intramuscularly. In the case of children the dose is reduced in proportion. This dose of 20,000 units intramuscularly is given daily for one week. In the event the disease is in the early stage and the ocular congestion subsides in this time, the injections are thereafter given at weekly intervals for several weeks longer. If the case is advanced and there is insufficient improvement at the end of the seven daily injections of 20,000 units, the daily injections are continued until marked improvement takes place, or the patient develops symptoms of an anaphylactic reaction. Thereafter the doses are given at weekly intervals in divided doses. The occurrence of a definite anaphylactic reaction to the horse serum is believed by Verhoeff^b to be of definite therapeutic value. The results reported by Verhoeff with this form of treatment are on the whole better than those reported by other observers, approximately 66 percent of the patients thus treated ultimately retaining useful vision.

Desensitization with uveal pigment has been proposed and utilized by the author in the treatment of sympathetic ophthalmia. This treatment is based on the conception that pigment allergy is one of the fundamental factors in the etiology complex of the disease, and

that by the removal of this factor by desensitization with the specific allergin—an antigen of uveal pigment—one of the essential factors in the disease would be removed and the progress of the disease itself affected. To date we have treated 23 patients. Eight of these were completely blind when first seen, and were treated only with the hope of controlling the active inflammation. The treatment was successful in four, or 50 percent, of these patients. Two patients disappeared from observation while under treatment, and there is no information as to their outcome. In the remaining 13 patients, the treatment was successful in nine, or 70 percent, both as to the control of the inflammation and the preservation of vision. The visual results, however, vary with the stage at which the patient was treated. Five patients were treated early in the disease. Three of these patients, in whom therapy was commenced immediately at the onset of the sympathetic symptoms, healed with 20/15 vision; the other two, treated somewhat later, when the vision had declined to 20/200, showed prompt subsidence of the inflammation with retention of this vision. Of the eight cases treated late in the disease, but still with some vision, five showed complete subsidence of the sympathetic inflammation and four of these had a final preservation of useful vision, while four went downhill steadily to blindness.

Autoserum therapy has been used by a number of authors in the treatment of sympathetic ophthalmia. The principle of this therapy is to remove the patient's own serum and usually to heat it to 60 degrees and then reinject it intravenously, intramuscularly, or subcutaneously. The underlying idea appears to be that this withdrawn serum undergoes some definite change, such as the formation of protein-split products, or some change in the equilibrium of the fluid, which gives the reinjected fluid an enhanced therapeutic effect. It has been used by Guiral and Guiral in the treatment of apparent sympathetic ophthalmia. Its use in sympathetic ophthalmia is definitely open to question, for it is far from evident that the cases reported

by these authors and treated by this method were actually those of sympathetic disease.

On the theory that sympathetic ophthalmia is essentially a tuberculo-toxic disease, various authors have advocated the treatment of sympathetic ophthalmia by the use of tuberculin. The tuberculous nature of sympathetic ophthalmia is, however, far from being a proved or recognized fact, and in the present state of our knowledge the use of tuberculin does not appear to be a justifiable procedure. Certainly no non-specific effect can be obtained with the extremely small doses in which tuberculin must be used, and the evidence is

individual severity of the disease, the time of institution of treatment, and with the thoroughness of the treatment employed. The literature is hopelessly confusing on the question of prognosis. The diagnosis in many of the reported cases is highly questionable, and is not confirmed by microscopic examination of the exciting eye. Many of the reported cases are selected to illustrate certain points of therapy, and illustrate only a portion of the author's experience with the disease. In many other patients the final result is not recorded. The difficulty of estimating the general prognosis is further enhanced by the fact that many patients do not come

Table 5

ALL CASES, IRRESPECTIVE OF CONDITION WHEN FIRST SEEN

Author	No. of Cases	Favorable Outcome		Unfavorable Outcome	
		No.	Percent	No.	Percent
Post	25	13	52	12	48
Verhoeff	35	24	66	11	33
Woods*	28	12	43	16	57
Joy	37	15	40	22	60
Total	125	64	51.2	61	48.8

8 Blind when first seen.

too meager and unproved to justify its use as a specific therapeutic agent.

The essential treatment of sympathetic ophthalmia is therefore twofold: first, local treatment to obtain the maximum mydriasis; second, general treatment, the basis of which is the use of sodium salicylate and either nonspecific protein therapy, preferably in the form of diphtheria antitoxin, or specific therapy in the form of desensitization with uveal pigment. The other general measures, such as diaphoresis, intravenous arsenicals, and tuberculin therapy, are of no proved value, and only result in the complication of the general picture.

Prognosis

The prognosis in any given case of sympathetic ophthalmia varies with the

under observation until the organic changes in the eyes are so advanced that the eyes are hopelessly lost. In such patients we can only surmise the possible result had they received proper treatment early in the disease.

There are, however, a few reports which give a fair idea of the general prognosis. Post has recently reported 25 cases of sympathetic ophthalmia, all proved by histologic examination of the exciting eye, in which the outcome is given in all instances. To these can be added the 35 cases of Verhoeff,* the 37 cases of Joy, in which the outcome is given, and the 28 cases of Woods. This gives a total of 125 cases, in which we have the final result, irrespective of the time when first seen or treatment instituted. Post reports 52 percent, Verhoeff 66 percent, Joy 40 percent, and Woods

43 per cent favorable outcome—subsidence of the sympathetic inflammation and retention of useful vision. Of the total 125 patients, 51.2 percent showed a favorable outcome, and 48.8 percent an unfavorable outcome. Table 5 shows these results.

These figures do not, however, tell the full story. While it is not so specifically stated, Post's cases were apparently all early cases, in which the eyes were not already lost when first seen. Six of Verhoeff's* cases were ap-

of controlling painful inflammation. Therefore if we consider only the early cases, patients who were seen while there was yet useful vision remaining, and who received adequate treatment in this stage of the disease, the prognosis appears better (table 6). Of such cases reported by Verhoeff, 80 percent showed a favorable outcome, and of such cases in Woods's series, 60 percent showed a favorable outcome. Including Post's figures with these, it appears that of patients observed rea-

Table 6
EARLY CASES

Author	No. of Cases	Favorable Outcome		Unfavorable Outcome	
		No.	Percent	No.	Percent
Post	25	13	52	12	48
Verhoeff*	29	24	80	5	20
Woods**	20	12	60	8	40
Total	74	49	66.2	25	33.8

* All treated with diphtheria antitoxin.

** Patients observed within first 3 months of disease.

parently hopelessly blind when first seen and treatment instituted. Eight of Woods's patients showed utterly lost eyes when first examined, and treatment was instituted only with the hope

sonably early in the disease, and receiving adequate therapy, a favorable prognosis may be expected in 66 percent of the cases.

References

- Critchett. Ueber sympathische Ophthalmie. *Klin. Monatsbl. f. Augenh.*, 1863, v. 1, p. 440. Heidelberg supplement.
- Dor, L. La guérison des deux yeux dans l'ophtalmie sympathique. *Arch. d'Opht.*, 1931, v. 48, p. 811.
- Fuchs, E. Ueber sympathisierende Entzündung. *Arch. f. Ophth.*, 1905, v. 61, p. 365.
- * Gifford, H. Sympathetic ophthalmia. *American Encyclopedia of Ophthalmology*, v. 16, p. 12369.
- Clinical and pathological notes on sympathetic ophthalmia. *Jour. Amer. Med. Assoc.*, 1900, v. 34, p. 341.
- Guiral, R., and Guiral, R. J. Tratamiento de la oftalmia simpatica por el autosuero. *Arch. de oftal. hisp.-amer.*, 1930, v. 30, p. 1.
- Haab, O. Ueber Chorioretinitis sympathica. *Trans. Heidelberg Ophth. Soc.*, 1897, v. 26, p. 165.
- Hirschberg, J. Klinische Beobachtungen. *Centralbl. prakt. Augenh.*, 1895, v. 19, p. 80.
- Jones, C. F., and Browning, S. H. Note on the blood in sympathetic ophthalmia. *Brit. Med. Jour.*, 1911, v. 1, p. 1426.
- Joy, H. H. A survey of cases of sympathetic ophthalmia occurring in New York State. *Arch. of Ophth.*, 1935, v. 14, Nov., p. 733.
- Meller, J. Intraoculares Sarkom und sympathisierende Entzündung. *Arch. f. Ophth.*, 1909, v. 72, p. 167.
- Mooren, A. Ueber sympathische Gesichtsstörungen. Berlin, A. Hirschwald, 1869.
- Nettleship, E. Sympathetic ophthalmitis. Report of Committee. *Trans. Ophth. Soc. U. Kingdom*, 1886, v. 6, p. 170.

- Ohlemann, M. Die perforirenden Augenverletzungen mit Rücksicht auf das Vorkommen der sympathischen Ophthalmia. Arch. f. Augenh., 1891, v. 22, p. 112.
- Ormond, A. W. Discussion. The more chronic forms of anterior uveitis. Brit. Med. Jour., 1910, v. 2, p. 1326.
- Post, L. T. Sympathetic ophthalmia; report of 28 cases. South. Med. Jour., 1934, v. 27, p. 421.
- Randolph, R. E., Norris, and Oliver. System of diseases of the eye. Philadelphia, J. B. Lippincott & Co., 1898, v. 3, p. 721.
- Samuels, B. Note on the pathology and surgical treatment of sympathetic ophthalmia. Proc. New York State Med. Soc., Sect. Ophth., Albany, N.Y., May 14, 1935.
- Schieck, F. Das Auftreten der sympathischen Ophthalmie trotz erfolgter Präventivenucleation und seine Bedeutung für die Lehre von der Entstehung der Krankheit. Arch. f. Ophth., 1918, v. 95, pt. 4. Abst. Brit. Jour. Ophth., 1919, v. 3, p. 463.
- Schirmer, O. Sympathische Augenerkrankung. Graefe-Saemisch Handbuch der Augenheilkunde. Leipzig, 1905, chap. 8.
- Theobald, G. D. The frequency of sympathetic ophthalmia. Amer. Jour. Ophth., 1930, v. 13, p. 597.
- ^a Verhoeff, F. H., and Irvine, S. R. Results of treatment with diphtheria antitoxin in thirty-five consecutive cases of sympathetic ophthalmia. Proc. New York State Med. Soc., Sect. Ophth., Albany, N.Y., May 14, 1935.
- ^b Verhoeff, F. H. An effective treatment for sympathetic uveitis. Arch. of Ophth., 1927, v. 56, p. 28.
- Woods, A. C., and Little, M. F. Uveal pigment. Hypersensitivity and therapeusis. Arch. of Ophth., 1933, v. 9, Feb., p. 200.

SCIENTIFIC AND PRACTICAL CONSIDERATIONS INVOLVED IN THE NEAR-VISION TEST WITH PRESENTATION OF A PRACTICAL AND INFORMATIVE NEAR-VISION CHART

JAMES E. LEBENSOHN, M.D., PH.D.
CHICAGO

Current near-vision charts are inadequate in many respects. The essential weakness lies in oversimplification. A single card attempts to cover diversified scientific and practical demands, whereas two distinctly different charts are requisite. One should be simple optotypes based on the one-minute angle; the other, a standardized reading text in the various sizes of customary print.

The original charts submitted are processed in a double-faced pyralin panel which renders them permanently changeless and stainless. The optotype side consists of miniature Snellen letter and number series adapted by photoreduction for use at 14 inches. The reading text on the other side consists of three columns: words in point type (Century Schoolbook); numbers of corresponding sizes; and a novel test for the illiterate. This column for the illiterate consists simply of groups of various combinations of x and o, and requires only that the illiterate be able to count. From the Department of Ophthalmology, Northwestern University Medical School. Read at the American Academy of Ophthalmology and Otolaryngology, in Cincinnati, Sept. 17, 1935.

Though near-vision charts were designed before those for distant vision, no model has received an acceptance comparable to the Snellen distance chart, since none has satisfactorily surmounted the many special difficulties inherent in near-vision testing.

Retrospect

The idea of arraying test-letters in series originated with Küchler, who in 1836 presented a near-vision test with a letter gradation from 1.5 mm. (9 point) to 21.5 mm. (120 point). Jaeger in 1857 published in Vienna an extended series, arbitrarily numbered from 1 to 20, and ranging from 0.5 mm. (3 point) to 19.5 mm. (110 point). The type was never standardized and the various editions show considerable divergency in the size, shape, and character of the fonts used.

At Snellen's suggestion (1862), reading charts have since been constructed in which the height of the small lower-case letters subtends a five-minute visual angle at stated distances of 0.37 m., 0.50 m., and so forth. For the abbreviation of meter, there has been unfortunately substituted in many cards the letter D of the Snellen formula, $V = d/D$. Since "D" is the abbreviation of diopter, a curious and fairly widespread confusion has resulted, many men referring to such charts as in the "diopter" system. On one of these charts the refractionist is instructed that "The number over the paragraph will be about the number of convex

glasses required for reading and sewing." Of course, such a correlation, though it does occur above 1.00 diopter, is purely accidental.

However, it is impossible to present reading matter in lower case that precisely conforms to the mathematical requirements of physiologic optics. Consequently, in 1885 Oliver¹ advocated that short words in capitals be used instead. From the practical standpoint the unrealistic nature of such a test is objectionable; and the psychologist would not consider that words and the optotypes from which they were formed are on the same level of recognition. The recent American Medical Association card for rating visual efficiency at the near point is based on the Oliver chart, but has been modified for use at 14 inches, and does not confine itself to the seven letters, C D E T O L F, which Oliver considered alone suitable.

In correcting the presbyopia of illiterates the ancient Chinese required the individual examined to look at the ridges on his finger tips. The limited intelligence of the illiterate demands a test of such simplicity. The geometrical symbols devised by Buchardt (1870), Landolt (1888), Fridenberg (1910),² Dor (1920),³ and the pictographs of Ewing (1920),⁴ though simple, are not simple enough; moreover, they fail to arouse interest, even in the adult illiterate.

Requirements

The essential weakness of our present reading charts lies in their over-

simplification. A single chart attempts to cover the diversified scientific and practical demands of near-vision testing, whereas two distinctly different charts are requisite: (1) Simple optotypes based on the one-minute visual angle, as in the distance charts; (2) a standardized reading text in the various sizes of customary print.

In addition, the doctor would do well to gather in a scrapbook empiric tests adapted to the individual needs of his clientele, such as cloth with needle and thread; clippings from newspapers and magazines; excerpts from the telephone directory, want ads, and market reports; specimens of music, playing-cards, road maps, and blueprints; samples of handwriting, typewriting, and shorthand; and, when needed, selections from foreign languages.

Miniature optotypes

The reduced optotype is the only scientifically accurate means by which the acuity of near vision can be ascertained. Reading texts can only approximately fulfill the same task. The selected distance chart can be reduced by photographic methods to give equivalent values at whatever near distance is decided upon as standard (Bjerke⁵). With a reduction to 1/17, the six-meter line subtends a five-minute angle at nearly fourteen inches (exactly 13.9 in., 35.3 cm.). This appears to be the most advantageous reduction, for it is in harmony with the efforts of the American Medical Association to standardize near-vision tests at 14 inches. With the miniature charts, as in distance testing, both a letter and number series are desirable.

Correlation of near and distance vision

The visual acuity of the normal accommodating eye, taken with the vertex of the correcting lens at the anterior focal point, is the same for distance and near. This is the result obtained by Bjerke⁶ and myself employing reduced Snellen charts, by Landolt⁷ using a miniature broken-ring chart, and by Snell⁸ with the Oliver chart. Hagner⁹ finds from theoretical considerations also that the effect of accommodation should be negligible.

Biedermann,¹⁰ however, reported an increased visual acuity for near, but he made his tests at 25 cm. (9.8 in.) with a miniature Landolt chart produced on a milk-white transparency; and Brückner¹¹ would discount his findings as probably due to small pupil, variations in illumination and attention, and so forth. Though it is true that objects subtending the same visual angle do not appear to be the same size at different distances (Aubert-Förster phenomenon), this is a purely psychological interpretation, and certainly does not affect the discriminatory power of the retina.

In presbyopia, the correcting lens not only restores the visual acuity for near, but increases the visual image 1.5 percent for each diopter added (Bjerke¹²). In aphakia, the anterior focal point is two centimeters or more from the corneal apex, and a correcting lens placed there would produce an image 1.5 times normal size. But as the lens is generally one centimeter nearer to the eye, this possible acuity is reduced 1 percent for each diopter (Bjerke¹²).

In abnormal eyes, Snell⁸ notes that the visual acuity for distance and near is generally parallel, except when the cornea or lens is involved; then there may be a significant difference.

Reading texts

"When the patient reading Jaeger 1 or Thorington 0.50 D asks how this compares with the newspaper, one is not able to answer definitely, as the relative value is not apparent" (Wells¹³). Reading is the predominant interest in near vision, yet (because of considerations which are better realized in reduced optotypes) the reading tests in use have no practical relation to reading experience. From this standpoint an arrangement of a standardized type in the point system would be definitely more useful.

As is now well known, we read in thought units and recognize words largely by their shape.^{14, 15} Because of such associations, words may be read when the component letters are so small that they could not be individually identified. Much of the characteristic appearance of a word is due to the fact that

there are three forms of lower-case letters: ascenders, descenders, and small sorts. Hence, to avoid the pitfalls of context and configuration, I would suggest that for the continuous text in our charts there be substituted a series of unconnected words composed wholly of small lower-case letters. This presents no difficulty, since nearly all the vowels and most of the more frequently occurring consonants are in this class. The idea is applicable to all languages written in Latin letters; thus:

English: arc room mason omen crane
 French: accuser amas amazon assez
 Spanish: acaecer acaró amara amer
 Italian: acume acro acrezza acre acervo
 German: anmassen arm azurn man aus

The point system

In the point system the various sizes of type bodies bear a fixed and simple relation to one another. According to the American system—adopted in the United States in 1886, and in England in 1898—the point is nearly one seventy-second of an inch or 0.35 mm. The basic idea originated with Fournier in 1737. Benjamin Franklin, while in France, purchased some of Fournier's foundry materials, which in time came into the possession of the leading American type-founding company, and became the models for their later designs. After the Chicago fire, John Marder, whose type foundry had been destroyed, moved the adoption of a point system based on their pica type, then in most general use. Consequently, the Fournier system, used in Belgium and parts of France and Austria, and the American system are practically identical.

The point system refers to the size of the type body without reference to the print. In any particular type design, however, the heights of the various characters bear a definite relationship to the size of the type. Thus in Century Schoolbook type the small sorts are just half the point size, so that when the body is 10 point, their height is five seventy-seconds of an inch or 1.75 mm. (5×0.35 mm.).

Century Schoolbook type

The Century Schoolbook type seems the most suitable design on which to standardize our reading tests since it is the result of an effort to produce the most legible type possible. The project was inspired by the Reports of the Committee to Inquire into the Influence of Schoolbooks upon Eyesight (1911-1913) appointed by the British Association for the Advancement of Science.

The design of Century Schoolbook is simple, fairly broad, with fairly thick lines, fairly wide spacing, and with not too much contrast of thickness and thinness. It is based upon the popular Century Expanded, an Old-Style face created by DeVinne, the master type designer of modern times.

Presentation of an original chart

Description. The two cards submitted are intended to supply the examiner conveniently with essential informative data as well as to provide for nearly all the requirements of near-vision testing. The first chart contains an explanatory paragraph; optotypes in two series; letters and numbers; and a staff of music. The second chart consists of three columns: words in point type; numbers of corresponding size; and an illiterate test.

The optotypes. The optotypes on the chart give a sequence of distance equivalent from 20/13 to 20/800. The distance Snellen charts from which the reductions were made were selected because they are among those most widely used, have an adequate range, and a corresponding letter and number series. The lower group (20/13 to 20/100 equivalent) represents a $1/17$ reduction; the upper group (20/200 to 20/800 equivalent) a reduction of $4/17$.

For each line the visual acuity is noted in four sets of interpretative data: decimal notation; reading norm (distance at which letter or number subtends the five-minute angle) in centimeters and inches; distance equivalent; and visual efficiency.

Music. Music was included because it is so commonly needed as an empiric test. The $1\frac{1}{2}$ -inch staff chosen is fre-

quently found in cheap editions, though the usual height in this country is two inches. The selection is the opening bars of our national air which so appropriately begins: "O say, can you see, by the dawn's early light. . . ."

Reading test. The reading test consists of words composed wholly of short lower-case letters, such as: wax see now zero arrow cream numerous occurrence nevermore—without any ascending, descending, or dotted characters. There is no context and no variation in contour to suggest clues to the memory. Of the 13 letters used, Sanford¹⁶ considers w m v the easiest to recognize, r x n u as moderately difficult, and a z o c e s the hardest. Of the eight most frequently occurring letters in English, five are represented by the short letters e a n o s.

The series extends from 24-point Century Schoolbook, the largest size used in books, to 2-point of the same type, which at 14 inches is beyond the limit of average discrimination. There is thus on the chart an end point for any individual's reading ability. Each gradation is furnished with data as to its letter height in millimeters; the visual acuity required—noted decimally and in distance equivalent; and its customary use in reading experience. (In rural newspapers 8-point type is customary, but in the city papers 7-point type is generally used. The "Chicago Tribune" uses 7-point Regal; the "Chicago Daily News," 7-point Ideal.)

Numbers. The value of numbers in near-vision testing has not been sufficiently appreciated. They are international symbols, universally recognized by all who have the least degree of literacy. When standardized, as in this chart, they are the preferred test for the foreigner, especially so if his language is customarily printed in nonroman characters, as with Russian, Greek, Yiddish, and German gothic.

Illiterate test. The illiterate test consists of four- and five-letter groups of various combinations of x and o. The illiterate is asked simply to count the "crosses" in each group, as in: oxox oxoxx. The examination requires only that the child or illiterate be able to

count. The reliability of the test has been checked by experiments with literates.

Format. A clean test chart is of the utmost importance, since the loss of contrast in a soiled chart must impair its validity. The efforts heretofore made to maintain the cleanliness of charts have been only moderately successful. I believe that the format ushered in by this chart solves the problem. A double-faced panel is fashioned by fastening on each side of a six-by-eight-inch piece of plywood a chart over which a thin sheet of pyralin is welded by heat and pressure. The finished product looks as if covered by a fine, clear lacquer. The pyralin panel is durable, shatter-proof, artistically attractive, and easily cleansed; the charts thus processed remain permanently stainless and changeless. In using the charts, a measuring cord attached to an eyelet on the panel's edge is secured by a hook to the end-piece of the patient's glasses or trial-frame, and when taut keeps the card at the required distance. For further convenience, there is affixed to the other edge of the panel a metal pointer.

Procedure. A few hints may be apropos as to the many uses of the chart. The distance vision is noted; *then the brightness of the near-vision chart is adjusted to a standard of ten candle-power*, preferably with the aid of a light meter. In the systematic examination, the following outline is suggested: I. Using optotypes,

A. Without distance correction, examine for

1. Near visual acuity (nV). This often provides an immediate basis for the judgment of the patient's refraction, since normally, and in most cases of ocular disease, the near visual acuity corresponds to that for remote vision (rV); but it is greater in myopia, less in hypermetropia and presbyopia. Even in the presbyopic, an idea of the distance refraction is obtained through the difference between their actual near vision and that to be normally anticipated.

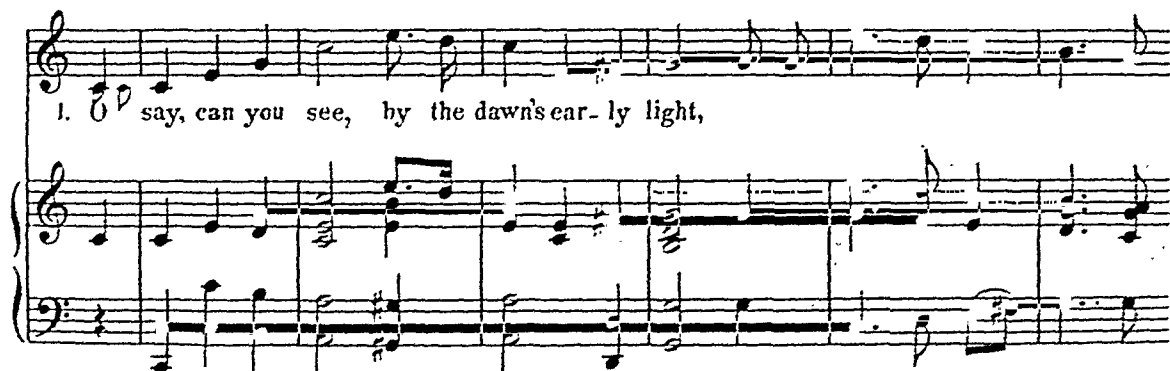
2. Far point of myopia. With the patient fixating on optotype 0.6, move chart away to the point of blurring. If

NEAR VISION TEST CHARTS

As designed by DR. JAMES E. LEBENSOHN,
Northwestern University Medical School, Chicago

The charts are to be read at 35 cm. (14 inches); (exactly 35.3 cm.; 13.9 in.) The reading visual acuity obtained from the miniature Snellen charts can be expressed in terms of distance equivalent, visual efficiency, or—as with corresponding distance charts—decimally, or in fractions. Thus "normal" reading visual acuity 1.0 can be recorded: 20/20 equivalent; 100% efficiency; 35/35; or 14/14;—reading visual acuity 0.8 as : 20/25 equivalent; 95.6% efficiency; 35/44; or 14/17. The adjoining test with point-type (Century Schoolbook) indicates what this means in practical reading ability. The left column therein is for illiterates who are simply to count the "crosses" in each group as in : o x x o o x o x x.

Decima- notation	Reading norm				Distance equivalent	Visual efficiency
	Cm.	In.				
0.025	1412	560	L 85		20/800	0.1%
0.050	706	280	F D 293		20/400	3.3%
0.075	471	187	E C T 8754		20/260	11.7%
0.1	353	140	L Z T D 63952		20/200	20.9%
0.2	176	70	F P	293	20/100	48.9%
0.3	118	47	T O Z	8754	20/65	66.8%
0.4	88	35	L P E D	63952	20/50	76.5%
0.5	71	28	P E C T D	420359	20/40	83.6%
0.6	59	23	E D Y C Z F	3740208	20/30	91.4%
0.8	44	17	F E L O P X Z	9270002	20/25	95.6%
1.0	35	14	20/20	100.0%
1.2	29	12	20/16	
1.5	24	9	20/13	



Letter height—
4.2164 mm.

24 Point

Acuity: Approx. 0.12 (20/170)
Sight-seeing texts.

man oxen

25 37 84 90

OXXO OXXX

Letter height—
3.2512 mm.

18 Point

Acuity: Approx. 0.15 (20/130)
Books, children 7-8 yrs.

raw see van

90 89 76 60 54

XOXXX OX000

Letter height—
2.5146 mm.

14 Point

Acuity: Approx. 0.2 (20/100)
Books, children 8-9 yrs.

noon even mew

38 72 80 93 54 60 76

XOXX XXXX 00XX

Letter height—
2.0828 mm.

12 Point

Acuity: Approx. 0.25 (20/80)
Books, children 9-12 yrs.

war use worm eve
avenue ransom err40 53 82 64 79 60 47
809 423 657 980 765XOOX 00OXO 00XXX
XOXXO XOXXO OX00X

Letter height—
1.7526 mm.

10 Point

Acuity: Approx. 0.28 (20/70)
Adult textbooks.

scum crease nervous
cocoon cannon saucer98 67 45 34 23 50 86 73 98
456 309 582 740 605 482 765X000 OXXO OXXX XXXX
OXX00 OX000 OX0X0

Letter height—
1.5748 mm.

9 Point

Acuity: Approx. 0.3 (20/65)
Magazines.

arrow scour noose razor
zone reverence sorceress35 98 20 82 47 30 74 73 42 65 27
740 203 965 423 807 203 460 244XXOX O0XX OX00X XOXX
X00XX O0X00 0000X OXOX

Letter height—
1.3970 mm.

8 Point

Acuity: Approx. 0.4 (20/50)
Newspaper text

amaze wares curve scarce
snooze caress sewer wax82 34 65 90 58 83 67 46 98 65 42 54
426 397 564 752 205 350 575 369 246OXXO 0000 XXXX XXXX 000X
XXXOX XX00X 00XXO XOXX

Letter height—
1.0414 mm.

6 Point

Acuity: Approx. 0.5 (20/40)
Telephone directory.

comma worse reason measure vase
census arrears recover crane now75 23 68 00 44 03 40 53 82 64 79 00 47 35
890 375 204 534 026 987 654 932 246 479 265X0XX 00X0 OXXO 0X00 XXOX 0000
X0XXO XX000 00000 00X00 X000X

Letter height—
0.8763 mm.

5 Point

Acuity: Approx. 0.6 (20/30)
Want ads.

success numerous assurance consume
cocoa convex morocco uncommon err56 87 92 30 47 62 45 27 95 80 46 23 43 80
209 354 872 405 625 829 204 350 575 482 657X0XX 000X 00X0 00XXX X0X0 XXOX 0X00
0X000 0X0X0 XXXX0 00XX0 XXXX0 0X00

Letter height—
0.6985 mm.

4 Point

Acuity: Approx. 0.8 (20/25)
Small bibles.

occurrence nevermore successor romance worm
craze arson crew dimorous scow broom bamboozle72 95 40 58 38 55 60 88 30 57 98 46
284 484 306 905 283 480 244 820 3500X00 X0XX XXXX XXX0 XX00 0X00 X0XX 00XX 0X0X
X000X 0X000 0000X X0XX0 0XXX0 00XX0 X0XX

Letter height—
0.5207 mm.

3 Point

Acuity: Approx. 1.0 (20/20)
Mailorder catalogues.

RELATION SACRIFICING SACRIFICING TYPING INEQUALITY TYPING TYPING TYPING TYPING TYPING
TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING34 66 79 90 47 92 83 82 84 47 36 38 63 36 73 54 43 66 30 57 98 56 46 30 33 43
754 303 642 808 746 977 864 922 346 479 298 377 728 298 480 244 829 204 350 575 482 65700XX 0000 XXXX XXX0 0000 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX
00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX

Letter height—
0.3493 mm.

2 Point

Acuity: Approx. 1.5 (20/13)
Photo-reduction.

RELATION SACRIFICING SACRIFICING TYPING INEQUALITY TYPING TYPING TYPING TYPING TYPING
TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING TYPING34 66 79 90 47 92 83 82 84 47 36 38 63 36 73 54 43 66 30 57 98 56 46 30 33 43
754 303 642 808 746 977 864 922 346 479 298 377 728 298 480 244 829 204 350 575 482 65700XX 0000 XXXX XXX0 0000 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX
00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX 00XX

this distance is beyond 22-23 inches (average norm), continue with the patient fixating on the next larger optotype, and so on.

3. Range of accommodation. In dealing with mild myopia, hypermetropia, or presbyopia, a +3- or +4-diopter sphere is placed before the eye, as suggested by Duane, and the near point and far point measured in diopters on a Prince's rule—measurement to start from the anterior focal point, 14 mm. in front of the cornea. The difference is the range of accommodation. This method is also recommended for testing the adequacy of cycloplegia.

4. Estimation of visual acuity as a substitute for the distance test:

(a) With hospital, house, or bed cases, where it is impractical to set up or utilize a distance chart, the progressive changes in visual acuity can be regularly recorded with the reduced optotypes.

(b) In the office, when the distance vision is below 20/200: Instead of having the patient walk to the chart, the distance equivalent can be determined at 14 inches. Vision as low as 20/800—which is equivalent to counting figures at two feet—can be thus conveniently measured.

B. With distance correction, can be demonstrated:

1. Near point of accommodation. Optotype 1.5 (average norm, 9 inches; 24 cm.) is adapted for this purpose.

2. Presbyopia. Reduction in near visual acuity parallels the recession of the near point. The decline duplicates that section of Donder's curve extending beyond 35 cm. Roughly, a reduction of normal distance acuity to 20/30 or 20/40 equivalent for near means 1.00 D. of presbyopia; and each succeeding notation represents a half diopter more. Thus a reduction to 20/50 equivalent means about 1.50 D. addition; to 20/65, 2.00 D.; to 20/100, 2.50 D.; to 20/200, 3.00 D. With the proper addition, the acuity finally attained should equal that for distance, or be only slightly less.

3. Value of increased illumination. That "more light means better sight" is readily proved by the optotype chart and the variable illuminator. With the vision at 1.0 (20/20 equivalent) at 10

candle-power brightness, it reaches to 1.5 (20/13 equivalent) with an increase to 80 candlepower.

4. Malingering. In simulation there is apt to be a marked difference between the visual acuity acknowledged for distance, and that to be correspondingly expected for near.

5. Visual efficiency. The formula for total visual efficiency proposed by the American Medical Association is:

$$\frac{rV.E. + 2 nV.E.}{3}. \text{ To illustrate: A my-}$$

opic person with -9.75 D. sph. as the best correction has a distance acuity (rV) of 20/40; with -6.00 D.sph. the visual acuity for near (nV) is 20/30 equivalent. The total visual efficiency is

$$\text{hence } \frac{83.6 + 2 \times 91.4}{3} \text{ or } 88 \text{ percent.}$$

In medico-legal work this chart should be a useful supplement to the American Medical Association rating card, as it shows certain gradations not present in the other.

Though the Jaeger series merits but historical interest, many industrial boards still require that near vision be recorded according to the Jaeger classification. What the Jaeger numbers mean in modern printing nomenclature is indicated in the following table (Century Schoolbook):

Jaeger series	1	2	3	4	5	6	7
Point system	3½	4½	6	7	7½	8	10
Jaeger series	8	9	10	11	12	13	14
Point system	12	12½	13	14	16	18	24

II. Using point-type chart, a basis is provided for

1. Judgment of patient's reading ability. This does not correspond to the smallest type visible (punctum remotum) but to the punctum optimum, which usually represents a 50 percent larger visual angle (Snell⁸). Thus, to read 6 point comfortably demands that the patient discern at least 4 point at the same distance; to read 24 point (sight-saving texts), at least 16 point should be legible; reading 9- or 10-point type (upper-class work) requires

a minimum of 6-point visual acuity. This divergence is explainable by a study of the reading movements, which indicate that a considerable part of the printed line is imaged, not on the fovea, but upon the parafoveal region (Roethlein¹⁸).

2. Concluding test in presbyopia. In correcting presbyopia, the preliminary examination with optotypes is intended to give only the approximate correction. The final adjustment is determined with the point-type chart. The distance at which the patient does his work is carefully noted. For 14 inches

or beyond, the attention should be directed to the 4-point type; for less than 14 inches, the 3-point type may be attempted.

The accuracy and latitude of these charts may suggest further uses.

I am indebted to Professor Sanford R. Gifford for encouragement, suggestion, and criticism; and to Dr. A. C. Snell of Rochester, N.Y., to the American Type Founders Sales Corporation, and to the National Society for the Prevention of Blindness for important data.

References

- ¹ Oliver, C. A. A new series of metric test-letters and words for determining the amount and range of accommodation. *Trans. Amer. Ophth. Soc.*, 1886, v. 4, p. 215.
- ² Fridenberg, P. A stigmometric card test for illiterates. *Arch. of Ophth.*, 1910, v. 39, p. 227.
- ³ Dor, L. Echelle optométrique universelle. *Rev. gen. d'Opht.*, 1920, v. 34, p. 317.
- ⁴ Ewing, G. E. Test objects for the illiterate. *Amer. Jour. Ophth.*, 1920, v. 3, p. 5.
- ⁵ Bjerke, K. Ueber die Verwendung photographisch verkleinerten Optotypen zur Bestimmung der Sehschärfe in der Nähe. *Arch. f. Ophth.*, 1902, v. 55, p. 46.
- ⁶ ———. Ueber die Verwendung von reduzierten Optotypen zur Entlarvung von Simulanten. *Ztschr. f. ophth. Optik*, 1917, v. 5, p. 55.
- ⁷ Landolt, E. L'acuité visuelle à la courte distance. *Arch. d'Opht.*, 1916, v. 35, p. 199.
- ⁸ Snell, A. C. Concerning observations of the sharpness of vision of abnormal eyes when tested at a distance and at near points. *Trans. Amer. Acad. Ophth. and Otolaryng.*, 1927, v. 32, p. 164.
- ⁹ Hegner, C. A. Zur Methodik der Sehprüfung. *Arch. f. Augenh.*, 1921, v. 88, p. 42.
- ¹⁰ Biedermann, H. Untersuchungen über die Sehschärfe beim Nahsehen. *Ztschr. f. ophth. Optik*, 1927, v. 15, pp. 1 and 34.
- ¹¹ Brückner, A. Klinische Untersuchungsmethoden. *Kurzes Handbuch der Ophthalmologie*. Ed. by F. Schieck and A. Brückner, Berlin, 1932, v. 2, p. 923.
- ¹² Bjerke, K. Ueber die Verwendung photographisch verkleinerten Leseproben zur Bestimmung der Sehschärfe in der Nähe. *Arch. f. Ophth.*, 1905, v. 60, p. 369.
- ¹³ Wells, D. W. A practical system of near test types. *Ophth. Rec.*, 1905, v. 14, p. 158.
- ¹⁴ Lebensohn, J. E. The hygiene of reading. *Illinois Med. Jour.*, 1935, v. 68, Nov. p. 425.
- ¹⁵ ———. The mechanics of reading. *Hygeia*, 1935, v. 13, Nov., p. 987.
- ¹⁶ Sanford, E. C. The relative legibility of the small letters. *Amer. Jour. Psych.*, 1888, v. 1, p. 402.
- ¹⁷ Lebensohn, J. E. Factors in the determination and interpretation of visual acuity. *Arch. of Ophth.*, 1933, v. 10, p. 103.
- ¹⁸ Roethlein, B. E. The relative legibility of different faces of printing types. *Amer. Jour. Psych.*, 1912, v. 23, p. 1.

STUDIES ON THE INFECTIVITY OF TRACHOMA

IV. On the bacteria cultivable from trachoma and clinically similar conditions

R. W. HARRISON, PH.D. AND L. A. JULIANELLE, PH.D.
SAINT LOUIS

An investigation of the bacterial flora in 243 cases of uncomplicated trachoma has been made. For comparative purposes cultures were obtained also from the conjunctivae of (1) a group of normal persons, (2) 50 cases of spontaneous folliculosis in children, (3) 10 cases of inclusion blennorrhea, and (4) a variety of acute conjunctivitides of uncertain diagnosis. No organism cultivated was typical of trachoma. The flora did not vary with severity or clinical stages of the disease or with presence or absence of epithelial-cell inclusions. All bacteria encountered in trachoma were isolated with similar frequency in other eye conditions. The same bacteria were also found in normal eyes, although less often.

Individually or pooled, each variety of organism isolated was inoculated a number of times into the conjunctivae of monkeys. Experimental trachoma was never induced even though the tissues from which the cultures were isolated did produce this condition. Filtrates of infectious trachomatous material when inoculated together with cultures supplied no supplementary factors capable of rendering the organisms specifically infectious.

It is concluded that none of the bacteria cultivable from trachoma is able to induce the experimental disease in monkeys. From the Oscar Johnson Institute, Washington University School of Medicine. Conducted under a grant from the Commonwealth Fund of New York, N.Y.

While engaged in an intensive study devoted to the etiology of trachoma corroborative evidence¹ has been brought forward from this laboratory which demonstrates that the disease is transmissible to animals with certain modifications and that it is infectious in nature. That the experimentally induced infection is specific² and unrelated to deficient or faulty nutrition³ either as a causal or associated factor has also been determined. As others have shown previously, further experiments indicated the likelihood that under specified conditions the infectious agent of trachoma does not readily traverse Berkefeld filters.⁴

Concurrently with the studies already reported, an investigation was made of the bacteria cultivable from trachoma and, for purposes of orientation and control, from clinically similar conditions, as well as from normal eyes. That a number of bacteria⁵ have been incriminated in the past as incitants of trachoma accentuated the necessity of such a study conducted carefully and elaborately. While the great majority of the organisms considered causally related to the disease had been eliminated before this work was initiated, the recentness of Noguchi's⁶ discovery of *Bact. granulosis* still necessitated a bacteriological study. It is true that in the meantime the accumulated

literature on *Bact. granulosis*, carefully analyzed by Bengtson⁷ and Weiss,⁸ had begun to alter the original conceptions regarding the specificity of this organism. A number of human inoculations,⁹ particularly well controlled by Thygeson,¹⁰ eventually nullified the single experiment in which Addario¹¹ reported trachomatous changes following administration of *Bact. granulosis* in the eye of a human volunteer.

Upon undertaking this study, it was proposed to determine the bacterial flora accompanying trachoma and then to study in monkeys the conjunctival reaction in response to inoculation or injection of the organisms isolated.

Methods

Culture material. Material for culture was obtained in most part from patients with early uncomplicated trachoma varying from two weeks to a few months in duration. A small number of patients had old chronic cases; most of them were undergoing acute recurrences of the disease at the time of observation. The majority of the individuals studied were from the Ozark Mountains and had been brought for treatment to the U. S. Trachoma Hospital at Rolla, Missouri. Others from whom cultures were made were Navajo Indians at Fort Defiance, Arizona, and native whites in Kentucky, Tennessee,

Georgia, Oklahoma, Missouri, and southern Illinois.*

Material for culturing was obtained by scraping the conjunctiva with a sterile platinum spatula, and by grattage. In occasional patients, when indicated therapeutically, tarsi and fragments of tissue were excised and studied. The tissue obtained was ground in sterile mortars without the use of sand or other abrasive. The material obtained by scraping the conjunctival surface was inoculated immediately on plates containing different media and into leptospira semisolid agar. Tissue fragments removed by grattage were collected in sterile 0.85 percent salt solution, broth, or Tyrode solution (1.5 c.c. per patient), and this was inoculated immediately into various media and, after transportation to the laboratory within a time interval of a few hours, was cultured in serial dilutions of 1:10 to 1:10,000 or 1:100,000. The number of separate cultures made from each patient averaged 20 for the first 82 patients and 10 for the whole series.

Cultures from 50 cases of spontaneous folliculosis and 10 infants with inclusion blennorrhea were taken following the same methods. In addition, cultures were made from material obtained by swabbing the conjunctivae of 20 normal persons and 20 patients with miscellaneous chronic eye diseases of unknown etiology and uncertain diagnosis.

Culture media. The culture media used were veal-infusion broth, Noguchi's semisolid leptospira agar, fresh rabbit kidney in ascitic fluid, sealed with sterile vaseline, Levinthal's agar with 2-percent sodium oleate, and veal-infusion agar enriched in various ways. The latter included rabbit or horse blood, alone or with 1-percent dextrose, and with the mixture of sugars used by

Noguchi for isolation of *Bact. granulosis*⁶; serum agar (1-percent horse serum) with 0.5-percent hemoglobin and the sugar mixture mentioned above; and in some cases 0.1-percent cystine was also added. All media were adjusted to pH 7.6.

The media were varied in concentration of peptone, agar, and blood. The percentage of blood was varied between 2 percent and 16 percent and four different peptones, Difco, Witte, Pfanstiehl, and Neopeptone were used. There were no appreciable differences, however, in variety or comparative numbers of organisms isolated, between a sufficient number of parallel cultures from the same patients.

Incubation of cultures. Cultures were incubated for periods of five days to two weeks before examination unless contaminated with molds or spreaders. All plate cultures were sealed with adhesive tape to retard evaporation. These measures were made necessary by the occurrence of slow-growing bacteria in the conjunctival sac.

In the earlier part of the work, duplicate cultures were grown aerobically and anaerobically at both 30° and 37°C. Anaerobic methods were subsequently discarded when it became evident that obligate anaerobes occurred with exceeding infrequency. After a large number of cultures (from 82 patients), it also became apparent that, with the media used, incubation at 30°C. gave more satisfactory results in that slow-growing organisms were more often overgrown by *Staphylococcus* at 37° than at 30°; some of the organisms encountered grow better at the lower temperature; and in almost every instance all bacteria grown at 37° were also isolated from 30° cultures. These results are not surprising when the exposed position of the eyelids and consequently their lower temperature are considered. Incubation of subsequent cultures at 37° was accordingly discontinued.

Isolation and identification of organisms

Plate cultures were examined without opening during the first few days

* Acknowledgment of indebtedness and appreciation for diagnosis of the patients and for coöperation in obtaining material is made to Drs. C. E. Rice, Robert Sory, J. E. Smith, P. E. Faed, and B. C. Welch of the U. S. Public Health Service; to Dr. P. D. Mossman, then of the U. S. Indian Service; to Dr. A. F. Lenzen of the Illinois Trachoma Eradication Program.

of incubation, and colonies which appeared late were particularly noted. When the plates were opened, the different kinds of colonies were described and counted and examined microscopically after gram staining. Organisms not readily identified were subcultured and classified later. Cultures in semi-solid and fluid media were first examined microscopically and then reseeded on blood-agar plates to obtain pure cultures for identification.

plate cultures from 50 patients selected at random. It was impossible, however, to determine accurately the actual amount of material seeded on a plate, so that the figures express relative values only. This summary is given in table 1.

An analysis of this protocol reveals a number of interesting observations. It will be seen that diphtheroids and staphylococci were encountered with far greater frequency than any other

Table 1

THE FREQUENCY AND DISTRIBUTION OF THE BACTERIA ISOLATED FROM 243 PATIENTS WITH TRACHOMA

Organisms Isolated	Occurrence in 2346 Primary Cultures		Distribution Among Patients		Average Number of Colonies per Plate*
	Number of Times Isolated	Percent of Total Cultures Positive	Number Positive	Percent Positive	
Diphtheroids	1270	54.1	226	93.0	7.4
Other gram-positive rods	344	14.6	157	64.6	0.3
Staphylococci	1230	52.4	233	95.9	3.6
a. Hemolytic	688	29.3	187	77.0	1.7
b. Nonhemolytic	810	34.5	213	87.6	1.9
Strept. haemolyticus	46	2.0	9	3.7	0.3
Strept. viridans	24	1.0	13	5.3	0.2
Strept. anhaemolyticus	19	0.8	17	7.0	<0.1
Pneumococci	31	1.3	13	5.3	0.1
Other gram-positive cocci	344	14.6	151	62.1	0.5
Gram-negative cocci	56	2.4	36	14.8	0.3
Gram-negative rods	524	22.3	157	64.6	0.8
Yeasts	27	1.1	25	10.3	<0.1
Filamentous forms	42	1.8	36	14.8	<0.1

* Average numbers of colonies per plate were computed from 250 primary plate cultures selected at random from the 243 cases studied.

The results of the cultures reported in this communication have been derived from 243 patients with trachoma. Exclusive of cultures in broth and those heavily contaminated with molds or air borne bacteria, 2346 primary cultures were made. In order to facilitate an explanation of the data bearing on the cultivation experiments, an attempt has been made to summarize comprehensively the results of the cultures in protocol form. The distribution of the different bacteria cultivated has been tabulated in terms of percentage of total cultures as well as of patients, and, that an example of the frequency of occurrence might be conveyed, an enumeration is appended based on 250

organism, with the former slightly predominant. The diphtheroids presented the usual pleomorphic variations in colonial appearance and staining reactions, while the staphylococci were not only of the hemolytic and nonhemolytic varieties, as indicated in table 1, but they exhibited gradations in elaboration of pigment from white to deep golden yellow. Since these variations, however, appeared to have no particular significance in the etiology of trachoma, it does not seem necessary to pursue them further.

In addition to the diphtheroids, other gram-positive rods were isolated from a majority of the patients. These organisms were largely comprised of sap-

rophytic forms. A small number of spore-forming bacteria are included in this group, but for the great part the organisms were very small and non-sporulating, and some of them were chromogenic. They were subcultured for further study and an attempt was made to classify them in a manner similar to that described below for the gram-negative rods.

Streptococci were isolated from a small number of patients. The hemolytic variety was isolated 46 times (2.0 percent), the viridans 24 (1.0 percent), and the nonhemolytic 19 times (0.8 percent). Yet, in terms of patients, the order of the frequency of occurrence is completely reversed as 3.7 percent, 5.3 percent, and 6.9 percent, respectively. In other words, when streptococci are found in patients, the hemolytic form grows most profusely. In general, it may be said that the streptococci on the conjunctiva in trachoma are of low virulence since none of the patients from whom the cultures were isolated showed any signs of postoperative infection. Moreover, a few strains of hemolytic streptococci injected intraperitoneally in white mice produced no special clinical signs.

Pneumococci were also isolated from a small number of patients (5.3 percent). They were differentiated from streptococci by bile-solubility tests. None of the strains was virulent for mice, and by agglutination tests with antisera of the fixed types, they were classified as group IV.

Other gram-positive cocci were isolated from 62 percent of the patients. They were not present in large numbers, so that they were rarely isolated in the higher dilutions of original material. They were obviously of the commoner saprophytic forms and included for the most part cocci of the tetragenus and Sarcina arrangement. It is safe to assume that they were only adventitiously present in the conjunctiva.

Gram-negative cocci were isolated in small numbers from about 15 percent of the patients. The majority were classified as belonging to the *M. catarhalis* group and were considered as common saprophytes. In contradistinc-

tion to its presence in Egyptian trachoma, the *Gonococcus* was never isolated.

While present on the conjunctiva of a large portion of patients (about 65 percent), gram-negative rods occurred in small numbers. Most of these grew relatively slowly, requiring two, three, four days or more before they appeared in culture. About half were chromogenic to some degree, and many resembled *Bact. granulosis* in superficial appearance. A few strains were hemoglobinophilic, later identified as Koch-Weeks bacilli, while occasional cultures were found to be *Morax-Axenfeld* bacilli.

Of the cultures resembling *Bact. granulosis*, five strains were subsequently identified as this organism by agglutination in specific antisera.* In each instance, the organism was isolated on dextrose blood-agar plates prepared according to the formula used for all the cases. It grew in more or less close proximity to colonies of *Staphylococcus*, an observation already made by Olitsky and Tyler.¹² On one occasion, *Bact. granulosis* was isolated from a patient with an eye condition of questionable diagnosis. While at the time the condition was suspected as trachoma, it may be significant that in the two years and more of constant observation the cornea has never exhibited the changes usually associated with trachoma.

After determining their inagglutinability in antigranulosis sera, the remaining strains of the group of gram-negative rods were studied for purposes of identification and classification. Each culture was observed for cell and colony morphology, growth in broth, motility, and ability to survive on plain nutrient agar. All were tested for gelatin liquefaction, nitrate reduction, production of indole, and fermentation of dextrose, maltose, lactose, sucrose, and mannitol. On this basis they were tentatively separated into 10 groups.

* The identity of the first three strains of *Bact. granulosis* isolated in this laboratory was subsequently verified by Dr. P. K. Olitsky of the Rockefeller Institute and by Dr. I. A. Bengtson of the U. S. Public Health Service.

Rabbit antisera were then prepared for one or two cultures of each group. Each antiserum was tested against all or a majority of the cultures within the group and against a number of strains from other groups. Agglutination tests showed no antigenic relationships within the groups arranged on the basis of morphological and biological properties and failed to establish any other classification of the cultures. It was not possible, therefore, to identify a large number of the gram-negative rods isolated from the patients with trachoma.

Yeasts and filamentous forms never developed more than one or two colonies per plate, and they were considered as adventitiously present.

An attempt was made to correlate the presence of certain bacteria with the presence or absence of epithelial-cell inclusions. The results show clearly that no difference is demonstrable in the distribution and occurrence of bacteria between patients with inclusions and patients without inclusions. Likewise, comparison of the flora of early trachoma with that of chronic trachoma showed no significant variations.

Cultures from 50 cases of folliculosis in children, 20 patients with various chronic conjunctivitis, and 10 infants with inclusion blennorrhea included practically all the bacteria isolated from trachoma. The relative frequency and distribution of the organisms so closely approximated those found in trachoma that there is nothing to be gained by a discussion devoted to the bacteria isolated from these conditions. The cultures from normal eyes are not strictly comparable since the methods of obtaining material for inoculation were different. Nevertheless, it may be said that inocula obtained by swabbing in these instances were relatively free of bacteria. While a few colonies of diphtheroids and staphylococci were cultivated from each individual examined, other organisms occurred rarely and were like those found in trachoma.

Inoculation of cultures in monkeys (*M. rhesus*)

Early during the course of this work, it was proposed to study the specific infectivity of the different varieties of

bacteria isolated from trachoma rather than to disregard any as extraneous or casual organisms secondarily present during the disease. Because it was already recognized that there is considerable variation both in the infectivity of trachomatous tissues and in the resistance of monkeys to this infection, it became necessary to correlate the results observed following inoculations not only of cultures but of the tissues from which the bacteria were cultivated; and, if necessary, to determine ultimately the susceptibility of the monkeys inoculated. In actually performing the experiments, then, it was found wise to inoculate cultures before determining the infective capacity of the original tissue (since the incubation period in monkeys may vary to one month) and compare the results later. This was done to avoid the possibility of rapid loss of virulence by the cultures during the interval required as incubation period. Consequently, cultures were administered as soon as possible after isolation, so that a number of the cultures inoculated were derived from what eventually proved to be noninfectious material. In general, the bacteria inoculated were initial plate cultures or first subcultures.

A total of 116 cultures, many of them closely related strains from different patients, were obtained from 31 patients, and these were inoculated into 56 monkeys. All inoculations were made with young cultures, either by swabbing after light scarification of the conjunctiva, or by broth instillation and subconjunctival injection after pricking the surface with the charged needle. Inoculations by swabbing were made either directly from plate colonies or from subcultures in semisolid leptospira medium, while the subconjunctival injections were made with cultures suspended in nutrient broth or with cultures grown in leptospira medium and undiluted. The latter method was employed in order to establish agar foci of the particular organisms in the conjunctival tissues. At first, individual cultures were inoculated, and later pooled suspensions containing from two to eight organisms from a patient or series of patients. When pooled the

cultures were combined in approximately the proportions in which they were isolated. A total of 78 inoculations was made in monkeys, and some of the monkeys were employed for more than one inoculation. In some instances the same strains were inoculated repeatedly over a period of time, in which case this was regarded as a single experiment.

A summary of the experiments on the infectivity of the bacteria isolated from trachoma is given in table 2. Before analyzing the data in this protocol, it should be pointed out that most of

lack of characteristic disease in the monkeys was not due to the resistance of the animals to infection, it was found necessary to reinoculate a number of the same animals with trachomatous tissues. It will be seen that 20 monkeys were subsequently inoculated with cultures from active material. Of this number, six received material which was unable to induce infection in normal control animals, while 14, on the other hand, were inoculated with tissues which induced follicles in previously unused animals, and of these, 13 presented typical infection. So, also, in six

Table 2

SUMMARY OF EXPERIMENTS ON INFECTIVITY OF BACTERIA ISOLATED FROM TRACHOMA

Source of cultures	Number of Inoculations	Monkeys		Monkeys Reinoculated with			
		Inoculated	Infected	Infectious Tissues		Noninfectious Tissues	
				Inoculated	Infected	Inoculated	Infected
From 16 tissues proved infectious	56	40	0	14	13	6	0
From 15 tissues proved non-infectious	22	16	0	2	2	4	0

the inoculations were followed by a transient, localized infection readily characterized as an acute conjunctivitis of varying intensity. Material from 16 patients was found to be infectious in the sense that it induced experimental trachoma in monkeys, while the tissues from 15 patients were found to be non-infectious. With 81 cultures derived from infectious tissues, 56 inoculations were made in 40 monkeys. None of these animals gave any clinical signs of experimental trachoma. With 35 cultures derived from noninfectious tissues, 22 inoculations were made in 16 monkeys, none of which gave evidence of specific infection. It is interesting in this connection that material from two of the patients was found to be noninfectious despite the fact that on primary culture Bact. granulosis was isolated. The identity of one of these strains was verified not only in this laboratory, but also by Dr. P. K. Olitsky and Dr. I. A. Bengtson. In order to ascertain that

monkeys, originally inoculated with cultures isolated from noninfectious material, two were specifically infected when they received tissues containing the active agent. It is, therefore, obvious that lack of infection following inoculations of cultures is due not to the resistance of the animals, but actually to an inability of the cultures to induce the disease.

The possibility, then, that any of the organisms isolated from trachoma may singly, and therefore specifically, induce experimental trachoma has been studied without gaining substantiating evidence. That the organisms pooled, and therefore nonspecifically, might be involved in causing the experimental infection has also been eliminated. It remained, therefore, to determine whether the bacteria might be associated with some factor in inducing infection. Several experiments were undertaken in which Berkefeld filtrates obtained, by a method previously de-

scribed,¹ from active trachomatous tissues, were inoculated simultaneously with a number of cultures. It was very quickly determined, however, that active tissues do not contain a filterable agent which might supplement any of the bacteria studied in inducing experimental trachoma. In some of the experiments, *Bact. granulosus* was injected with the filtrates, and in others, unidentified gram-negative rods. This study was discontinued at this point, since the results already acquired did not warrant further experimentation with this possibility. The experiments with filtrates, however, lend further confirmation to a preceding study in which it was shown that in general the infectious agent of trachoma does not permeate Berkefeld filters.

Discussion

The consecutive studies conducted in this laboratory on the etiology of trachoma were originally undertaken on the principle that an approach to this complicated problem would be most constantly accessible through the process of elimination. On this basis, it was first determined, as others have demonstrated before, that trachoma is an infectious disease transmissible to monkeys with certain modifications. It then became possible to eliminate diet as a causative factor in the experimental infection when it was found that defective nutrition had no significant effect on the evolution of the disease. This conclusion receives confirmatory evidence from the recently published observations on humans by Rice, Sory, Smith, Faed, and Drake,¹³ and by Tang.¹⁴

Progressively, experiments devised to determine filterability of the infectious agent of trachoma, in the sense that it passes through Berkefeld filters without great loss in infectivity, eliminated filtration as a method of further study. In this connection, it is important to point out that recent observations by Thygeson and Proctor,¹⁵ and by Thygeson, Proctor, and Richards,¹⁶ demonstrate that the agent of trachoma, while unable to penetrate through candle filters (kieselguhr, or porcelain), actually pervades Elford membranes (collodion). On the other

hand, Stewart,¹⁷ using similar conditions of filtration, concludes that the infectious agent of trachoma does not go through Elford filters, and Cattaneo¹⁸ also found that ultrafiltration through collodion membranes deprives trachomatous tissues of infective activity.

In advancing the general investigation, the present study was devoted to the bacteria cultivable from trachoma. Numerous alterations in technique and culture media were employed without particular variations in results. The only organisms found with any constancy have been the different varieties of *Staphylococcus* and diphtheroids. A large number of bacteria, however, have been isolated, but with little frequency. A large number of gram-negative rods, in many respects resembling *Bact. granulosus*, were isolated. Further study revealed, however, that only five of these strains were *Bact. granulosus*, and the remaining were not identified despite a definite, concerted effort to classify them. The failure to observe any characteristic flora in trachoma has been commented upon by a number of authors.¹⁹

It was not possible to correlate the bacteria cultivated either with the stage of the disease or with the presence of epithelial-cell inclusions. However, it is evident from a parallel study made of the bacteria cultivable from folliculosis, inclusion blennorrhoea, and chronic conjunctivitis of unknown etiology, that the bacteria isolated from trachoma are indistinguishable from those encountered in other eye conditions. Indeed, a comparative analysis of the data reveals an agreement in cultures of 98 percent between trachoma and the other diseases.

Experiments were conducted to establish the specific infectivity of the different organisms cultivated by inoculating eyes of monkeys with demonstrated susceptibility to the disease. The technique of inoculation was varied and the bacteria were inoculated singly and pooled as soon after isolation as possible. Yet the results are striking that in no instance has it been possible to induce the experimental infection by administration of the cultures, although the tissues from which the organisms

were derived were actively infectious. Further experiments disclosed that even when inoculated simultaneously with Berkefeld filtrates of infectious tissues, the cultures were found to be incapable of causing specific infection. The results of the present investigation, therefore, offer no evidence to support the concept that bacteria are involved in the causation of trachoma.

Summary and conclusions

1. A study has been made of the bacteria cultivable from trachoma and clinically similar diseases as well as from normal eyes.

2. The bacteria cultivable from trachoma are not typical of that infection since they are also recoverable in approximately similar frequency for other conditions of the eye.

3. While less numerous, the same bacteria may be isolated from the eyes of normal individuals.

4. The bacterial flora of trachoma does not vary with the different clinical stages of the disease nor with the presence of epithelial-cell inclusions.

5. Inoculation into susceptible monkeys of all the different varieties of cultures isolated, either individually or pooled, does not induce experimental trachoma even though the tissues from which the bacteria are derived are demonstrably infectious.

6. Filtrates of infectious trachomatous material when inoculated simultaneously with the organisms isolated exhibit no supplementary nor associated activity capable of rendering the organisms specifically infectious.

7. The observations made in the present study furnish no evidence, therefore, that any of the bacteria cultivable from trachoma induce the experimental disease in monkeys.

640 S. Kingshighway.

References

- ¹ Julianelle, L. A., and Harrison, R. W. *Amer. Jour. Ophth.*, 1933, v. 16, p. 857; also 1934, v. 17, p. 1035.
- ² ———, 1935, v. 18, p. 10; also Harrison, R. W. *Jour. Inf. Dis.*, 1935, v. 56, p. 49.
- ³ Hettler, R. A., and James, W. M. *Amer. Jour. Ophth.*, 1934, v. 17, p. 1048.
- ⁴ Julianelle, L. A., and Harrison, R. W. *Amer. Jour. Ophth.*, 1935, v. 18, p. 133.
- ⁵ Koch, R. *Wien. Med. Woch.*, 1883, v. 33, p. 1550.
- ⁶ Michel, J. *Arch. f. Augenh.*, 1886, v. 16, p. 348.
- ⁷ Müller, L. *Wien. Klin. Woch.*, 1897, v. 10, p. 920.
- ⁸ Axenfeld, T. *Die Aetiologie des Trachoms*. Jena, Gustav Fisher, 1914.
- ⁹ Greef, *Berl. Med. Woch.*, 1913, v. 35, p. 513.
- ¹⁰ Ochi, S. *Klin. Monatsbl. f. Augenh.*, 1931, v. 86, p. 309.
- ¹¹ Noguchi, H. *Jour. Exp. Med.*, 1928, v. 48, Suppl. 2.
- ¹² Bengtson, I. A. *U. S. Public Health Reports*, 1932, v. 47, p. 1914.
- ¹³ Weiss, C. *Jour. Immunol.*, 1933, v. 25, p. 227.
- ¹⁴ ———, *Arch. Inst. Past. Tunis*, 1930, v. 19, p. 433.
- ¹⁵ Bietti, G. *Bull. Ocul.*, 1930, v. 9, p. 1171.
- ¹⁶ Castello and Lumbau. *Att. Cong. Oftal. Roma*, 1930, p. 550, cited by Favoloro (see below).
- ¹⁷ Wilson, R. P. *Brit. Jour. Ophth.*, 1931, v. 15, p. 433.
- ¹⁸ Takamatsu, T. *Acta Soc. Ophth., Jap.*, 1931, v. 35, p. 797. (Abstract in *Zeit. f. d. ges. Ophth.*, 1932, v. 26, p. 469.)
- ¹⁹ Nicolle, C., and Lumbroso, U. *C. R. Acad. Sci.* 1931, v. 192, p. 1173; also *Arch. Inst. Past. Tunis*, 1931, v. 20, p. 239.
- ²⁰ Puscariu, E., and Nitzulescu, J. *Ann. Ottal. Clin. Ocul.*, 1932, v. 60, p. 393.
- ²¹ Favoloro, G. *Rassegna Ital. Ottal.*, 1932, v. 1, p. 26.
- ²² Candian, F. L. *Latencia Parmeuse*, 1933, v. 5, p. 224.
- ²³ Tang, F. F. *China Med. Jour.*, 1934, v. 48, p. 839.
- ²⁴ Thygeson, P. *Arch. Ophth.* 1933, v. 10, p. 1; also *Rev. Internat. du Trachome*, 1934, v. 17, p. 1048.
- ²⁵ Addario, C. *Rev. Internat. du Trachome*, 1931, v. 8, p. 14.
- ²⁶ Olitsky, P. K., and Tyler, J. R. *Arch. of Ophth.*, 1933, v. 10, p. 440.
- ²⁷ Rice, C. E., Sory, R., Smith, J. E., Faed, P. E., and Drake, A. A. *Amer. Jour. Ophth.*, 1934, v. 17, p. 735.
- ²⁸ Tang, F. F. *China Med. Jour.*, 1934, v. 48, p. 839.
- ²⁹ Thygeson, P., and Proctor, F. I. *Arch. of Ophth.*, 1935, v. 13, p. 1018.
- ³⁰ Thygeson, P., Proctor, F. I., and Richards, P. *Amer. Jour. Ophth.*, 1935, v. 18, p. 811.
- ³¹ Stewart, M. *Eighth Ann. Report Giza Mem. Ophth. Lab.*, 1933, v. 8, p. 142; also *Brit. Med. Jour.*, 1935, v. 1, p. 1261.
- ³² Cattaneo, D. *Rev. Internat. du Trachome*, 1932, v. 9, p. 186.
- ³³ Bengtson, I. A. *Amer. Jour. Ophth.*, 1929, v. 12, p. 775.
- ³⁴ Lawrynowicz, A., and Melanowski, W. H. *Klin. Monatsbl. f. Augenh.*, 1931, v. 86, p. 262.
- ³⁵ Wilson, R. P. *Fourth Ann. Report Giza Mem. Ophth. Lab.*, 1930, v. 4, p. 63.
- ³⁶ Pacalin, G. *Arch. d'Ophth.*, 1930, v. 47, p. 690.
- ³⁷ Tang, F. F. *China Med. Jour.*, 1930, v. 16, p. 68.
- ³⁸ Thygeson, P. *Amer. Jour. Ophth.*, 1931, v. 14, p. 1104.
- ³⁹ Lumbroso, U., and Van Sant, H. *C. R. Acad. Sci.*, 1931, v. 192, p. 1140.
- ⁴⁰ Nogami, T. *Klin. Monatsbl. f. Augenh.*, 1931, v. 86, p. 313.
- ⁴¹ Reiman, H. A., and Pillat, A. *Jour. Exp. Med.*, 1931, v. 56, p. 687.
- ⁴² Morax, V. *Rev. Internat. du Trachome*, 1931, v. 8, p. 133.
- ⁴³ Seidler, M., and Stasniski, J. *Klin. Monatsbl. f. Augenh.*, 1931, v. 86, p. 261.
- ⁴⁴ Taborisky, J. *Folia Ophth. Orient.*, 1932, v. 1, p. 34.
- ⁴⁵ Tang, F. F., and Chou, C. H. *Jour. Inf. Dis.*, 1935, v. 56, p. 264.

LIPODYSTROPHIA PROGRESSIVA WITH OCULAR COMPLICATIONS

Further report

J. W. CHARLES, M.D. AND M. HAYWARD POST, M.D.
SAINT LOUIS

This report continues and concludes the visual history of a patient with progressive lipodystrophia, whose condition was originally described before the American Ophthalmological Society in 1926. The ocular complications in this case were: right eye, corneal ulcer, pallor of the disc, the choroidal atrophy; left eye, complete clouding of the cornea, preventing any view of the fundus. The cilia were partly or completely absent on both sides. Operations to bring the eyeball forward and to cause the lids to recede resulted in corneal improvement bilaterally. In 1933, the vision in the right eye was still normal. In 1934, the patient applied for a pension for the blind. A leukoma on the cornea of the right eye had reduced vision to hand movements at one foot. There was very little movement in the left eye, and limited movement on the right side. The conjunctivae were passively congested and the scleras resembled marbles. Projection was still normal in each eye. This ocular pathology accompanied a progressive wasting away of the fatty tissue in the face, neck, and shoulders, the extremities being affected to a lesser degree. Read before the American Ophthalmological Society at Hot Springs, Virginia, June 5, 6, 7, 1935.

This case was first reported by Dr. Hiram K. Liggett and one of us (J. W. C.) at the meeting of this society in 1926. At that time the results of Dr. George Ives's laboratory examination and Dr. Liggett's findings showed a normal condition, except for a slight hyperthyroidism.

Progressive fat atrophy begins with the superficial fat of the face and extends to the neck and breasts and down as far as the waist. Any attempt to increase the weight may add fat to the buttocks and thighs, but rarely to the upper part of the body. The sucking pads of the cheeks disappear, a condition that does not occur in wasting diseases; for instance, in tuberculosis. The appearance of the patient's face was first described as "death-mask."

According to Sprunt, three theories concerning the etiology have been advanced: (1) that it is a disease of the nervous system—a trophic neurosis; (2) that it is an endocrine disturbance; (3) that it is a disease of the adipose tissue itself. None of these theories has quite satisfied us. We are inclined to agree with Dr. Leland B. Alford, who made our first neurologic examination, and with Dr. Andrew B. Jones, who furnished the last one published in this report—that an abiotrophy more nearly explains the condition. Most of these patients seem to be normal, the only symptom that appeared in a few being a slight hyperthyroidism.

The original history of the patient will be found in the Transactions of this Society of 1926, and in the Journal of the Missouri State Medical Association of June, 1927.

After Dr. Liggett and one of us (J. W. C.) had issued the report on this case, we sent the patient to Barnes Hospital, under the care of Dr. M. Hayward Post and Dr. Vilray P. Blair, in order to learn if something could not be done to advance the blind eye in the orbit, and thus bring the globe again into contact with the lids.

Abstract of Barnes Hospital record no. 14331

"Mrs. — was first admitted to Barnes Hospital on February 14, 1928, and discharged on March 17, 1928. The diagnosis made at that time was ulcers of the cornea of each eye; hypotension; lipodystrophia progressiva. On February 16th, a plastic operation was done on the right orbit. On March 1st a second plastic was done on the same orbit. On admission, the right eye showed a corneal ulcer, 3 by 4 mm. in size, in the lower nasal quadrant. There was complete clouding of the left cornea, with a highly vascularized scar. The right disc showed definite pallor; the edges were blurred, due to some choroidal atrophy about the papilla. The fundus of the left eye could not be made out. Many cilia were absent from the lids of the right eye, and all

from those of the left. All teeth were absent. No tonsillar tissue was made out. The blood pressure was 115/55. It was noted that there was adequate adipose tissue up to the lower costal margin, and that there was slight pitting of the ankles on pressure.

"There was nothing of special interest in the history except chronic constipation. The patient had had one child only, who died shortly after birth. Delivery had been difficult. Following the birth of the child, she was confined to bed for six weeks. There had been no further pregnancies. Loss of weight began one year after the birth of the child, eighteen years previous to admission to the hospital. During those years the weight fell from 155 to 110. The eyes began to recede in 1920. Ulceration of the cornea of the right eye began six weeks before admission."



Fig. 1 (Charles and Post). Charles and Liggett's patient at 26 years.

To quote the record of Dr. Vilray P. Blair, who operated on the right eye under local anesthesia on February 16th: "Passed hypodermic needle along the upper and outer wall of the orbit deep into the orbit and injected fluid (normal saline) behind the globe. Globe moved forward about one-fourth inch.

A good deal of fluid came out into the eyelids and considerable hemorrhage followed the injection." The practical result was a forward movement of the eye of one-fourth inch only. At the second operation on March 1st, Dr. Blair "cut the median palpebral ligament and also the palpebral fascia close

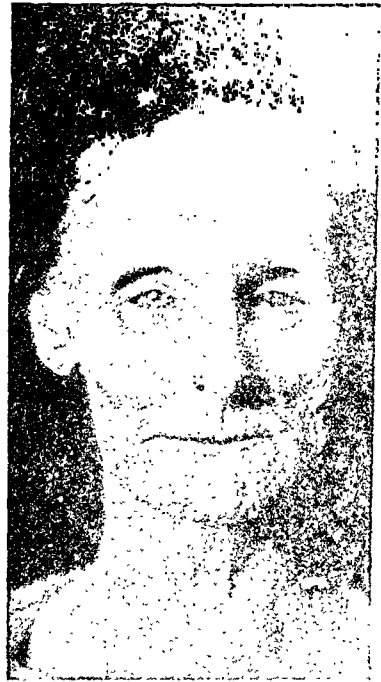


Fig. 2 (Charles and Post). Charles and Liggett's patient at 46 years.

to the lacrimal sac for about one-fourth inch above and below the ligament." He also "cut the lateral palpebral ligament externally through a transverse incision, and almost one-half inch of the attachment of the palpebral fascia above and below the ligament. This apparently allowed the lids to drop back somewhat." The operation was done in an effort to approximate the lids to the globe. A pressure dressing was applied. Following this procedure slow improvement took place. The ulcer of the cornea of the right eye healed, and clearing commenced in the cornea of the left eye above and to the nasal side. The patient was discharged from the hospital shortly afterward.

Laboratory findings during the patient's stay in the hospital were as follows: Urine clear; specific gravity

varied from 1008 to 1020; sometimes alkaline, sometimes acid, in reaction. No albumin; no sugar. There were a few hyaline casts and an occasional white blood cell. There were many epithelial cells. No acetone and no guaiac reaction. The P.S.P. for the first hour was 40 percent. It was not taken for the



Fig. 3 (Charles and Post). The patient at the age of 54 years.

second hour. Blood examination showed red cells numbering from 4,880,000 to 5,450,000, and white cells from 5000 to 8700; hemoglobin, 90 percent. Wassermann and Kahn tests were negative.

The patient was readmitted to the hospital on March 27, 1928, and on April 11th a few adhesions of the lids to the left eyeball were broken. The upper and lower lids were sutured together, and a rubber drain was inserted. On May 16th she was discharged for the last time. The sutures had been removed, and the corneal condition was considerably improved. In 1933, the patient was exhibited before the American College of Surgeons, at which time the vision of the right eye was still normal.

In the fall of 1934, the patient was sent to Dr. Post with an application

blank for a pension for the blind. Some months before, she had felt pain in the right eye and did not, as instructed, seek immediate relief. When seen by Dr. Post, there was a leukoma on the cornea of the right eye and her vision was reduced to hand movements at one foot. Projection was still normal in each eye. There was very little movement in the left globe, and limited movement on the right side. The conjunctivae were passively congested, and the scleras resembled marbles.

Dr. Liggett has furnished us the following report: "Mrs. — was seen by me from November 19 to November 26, 1934, for a check-up after seven years' absence. I found her thinner than at my last examination, having reached a weight of 101 pounds, or a loss of ten pounds. The fat loss was more extensive about the head and neck than ever



Fig. 4 (Charles and Post). The patient at the age of 54 years.

before, so that one could almost palpate the cervical processes from the front. Fat loss in the extremities was not so marked, yet there was great emaciation of the lower extremities.

"She felt well, although weaker—no infection of note. No constitutional symptoms. Her hair has fallen out

rather profusely during the last year. Her thyroid was distinctly larger than it was seven years ago, the circumference of the neck having grown from 29.5 cm. to 33.5 cm. despite the progressive loss of fat. Pulse, 92 (basal pulse, 72 to 80). Urine normal except for a faint trace of albumin. Basal metabolism was -10. Red blood count, 5,152,000 and white blood counts, 2006 and 3100 on different days. The differential showed 30 and 32 neutrophils, respectively.

"There is possibly some hypothyroidism and the fat loss has been progressive in the upper part of the body. Her general organic condition seems good. The neutropenia is very interesting and is not accounted for, as she had no

mucous-membrane infection that was demonstrable."

The neurologic examination was made by Dr. Andrew B. Jones, who reports that "the tendon jerks are present, equal, and active. The plantars are flexor in type. There is no gross change in sensation. The station and gait are altered only by her visual difficulties. The strength of the arms and legs is remarkably preserved. The most remarkable feature of the case is the seemingly total absence of tissue fats in the face, neck, shoulders, and upper thorax. This is true of the hands and forearms to a lesser degree. The condition is one of the abiotrophies."

3720 Washington Ave.

524 Metropolitan Building.

OPHTHALMIC ERRORS

HANS BARKAN, M.D.

SAN FRANCISCO

This paper outlines the personal qualifications needed to practice ophthalmology successfully, and the need for proper training in the field. It deals with errors in prescribing glasses, with errors in therapy, in surgery, and in prognosis, but does not lend itself to abstracting. Read before the Academy of Ophthalmology and Otolaryngology at Cincinnati, September 17, 1935.

A great deal of temerity is needed to approach this subject: we dislike to think of our own errors, though occasionally viewing those of our confrères with a certain amount of sympathetic satisfaction. I can only ask in excuse of the title that as the essayist has committed all the allowable errors and some of the inexcusable ones at various stages of his career, he may with this admission be pardoned if he points out the mote in the eye of his colleagues, admitting the beam in his own, willingly.

A certain number of us have made our first error in ophthalmology by becoming ophthalmologists in the first place: we were led into the field by practical expediency or fortuitous circumstance and have done our best. But if ever a field of medicine required especial aptitude, it is that of ophthalmology. Without a gentle and unusually dexterous hand, and preferably bimanual dexterity, many errors, and

even, with the best intentions, repetitions of the same error occur. Unless there is a natural disinclination to interfere drastically in any happening, event, or course of proceeding there is likely to be too much meddling with too many drugs or instruments. If the temperament is too sanguine, too much reliance is placed on the spontaneous cure of cases, aided, perhaps, by one particular fetish of a medication, and then naturally not enough attention is given to meticulous examination, with perhaps microscopic evidence overlooked that would warn us of trouble to come. If one is of too pessimistic a turn of mind, not inclined to let natural healing processes alone, is unduly frightened by an occasional extra tear or injected vessel, adopting a new medication for every trivial change in the clinical picture, the eye may finally get well in spite of treatment, or refuse to because of constant well-intentioned but apprehensive meddling. If one lacks the quality of

making fine distinctions mentally between right and wrong, between moral and unmoral, between music and noise, between what is genuine in art or literature and what is hokus pokus—if, in other words, one has only the common good sensible practical head of the average highly competent individual, he is going to make many errors in our field—he then just does not possess that sensitivity of intellect needed, I believe, to appreciate properly the innumerable shadings of ocular disease. When we stop to realize that this finesse of judgment and the action based on it has to be built up on a generous base of general medical knowledge, we stop before the really great and nearly errorless of our profession, past and present, in humble admiration of their qualities as men and as scientists.

Errors due to insufficient training are perhaps the hardest to get rid of, due greatly to the fact that we do not know that we possess them. They are almost positive liabilities instead of negative factors. They occur again and again, followed always by the same bad results, and unfortunately what Jack has not learned as a boy, John will not acquire as a man. A violinist who has not learned the proper and convenient finger positions as a boy, as a man leaps about the strings in frenzied attempts to get notes into a certain space of time: so the man who has not acquired as an operator what the Germans call "Schule," is distinguished mainly by his lack of proper tempo. The operation is hurried in one detail, slowed up for another—each step looks as if it were the operation and not to be followed by another logical move—all is disjointed. It is a good deal like the pulling of a tooth in irregular hurried and spasmodic jerks. The door to grievous error is wide open. As a refractionist his lack of physiological knowledge makes him the slave of his complicated tools: his machinery dictates the prescription, instead of being only an accessory to his appreciation of the patient's particular needs, his age, mentality, working hours, and distance, his general physical well-being, past history in regard to glasses, and future plans in life. The reading prescription with the same eyes

is different in the case of the well-fed dowager and the thin little professor of entomology. The commonest error of many of us, including my own, is the over correction of the presbyopic patient. We move him up too close in response to his demand for better near vision of small print, thereby increasing the effort at convergence, and fail to realize that as accommodation vanishes so the reciprocal innervation between convergence and accommodation, too, is disturbed, and convergence is now physiologically unwilling to be called upon too drastically.

Frequently we are distressed by the fact that our prescription as written is not what the glasses prove to be. There one may have committed the error, and how often it is a result of the "hurry" of our office, of not having centered the trial frame accurately and of not having measured and mentioned the distance between the posterior surface of the trial lens and the corneal vertex. In low degrees of correction it is of little consequence, but in any correction approaching or exceeding 4-5 D. it is of decided importance. Another common error is not to ascertain the P.P. and P.R. of each eye separately: occasionally there is a marked difference which not only has a bearing on the prescription but manifests a formerly unsuspected neurological condition. Our friend the myopic patient, usually free of subjective complaints except that of poor vision, must not be led into trouble: never correct a high myopia, not previously corrected, too abruptly. Workmen have fallen off roofs, and linesmen off power poles as a result. Sensitive people feel it a psychological insult to have the radius of their formerly rather restricted visual circumference increased tenfold, with mental reactions so far unused suddenly called into constant visual activity. We can obtain comfort and the necessary visual acuity, when needed, by giving one half to two thirds of the distance correction, and then add a monocular —5 or —10 to be used as a hook-on. Prof. Löhlein of Freiburg recently mentioned the case of a general practitioner with a myopia of 34 D., who could comfortably wear only a —20 and had

difficulty in finding the houses of his patients. With a monacle of —10 added for these occasions he could find the house number and could continue in practice comfortably. In cases of high hyperopia or aphakia with amblyopia, better vision can occasionally be obtained by holding a plus 10-D. lens about 10 cms. in front of the corrected eye, thereby through enlargement of the retinal image obtaining as high as twice the distance vision obtainable by the cataract glass alone. By monocular reading, so as not to exert convergence, and then by an appropriately strong convex glass to bring the print as close even as 10 cms., I have seen patients read J.1 who with their ordinary reading correction read only J.4. In some cases this enabled them to continue their life work. When combined with a music stand on which the book can be placed, so that it must not be held close or the head lowered, and with strong convex lenses with an appropriate prism, base in, comfortable reading can occasionally be obtained when all other means have failed.

It is an error to suppose that all headaches, like Caesar's division of all Gaul into three parts, are due either to the right eye, the left eye, or both eyes. Often the patient's money and our time are saved by speaking to the family physician after the first visit. The history is often illuminating in this regard: headaches occur, say, only with the periods; or only in the morning and are relieved by a cup of coffee and moving about; or only when stooping; or after a cold; or only after worry or psychological excitement, and so forth. With patients inclined to many complaints, and a wandering story, I have often prevented the error of false valuation of symptoms by saying, "Suppose I were a magician and simply by waving my hand could completely rid you of *one* complaint, which would you choose to be rid of?" It frequently works well.

In pointing out what seems to me a recurring error in therapy—though here, naturally, we are in the most empiric of fields, with so much play of prejudice, so many likes and dislikes, such conservatism, radicalism, or liber-

alism, and with so little to cling to scientifically, that the errors fairly bristle—may I speak of tuberculin and the errors it leads to? Not the giving of it primarily and not the question as to whether the process it is given for is tuberculosis in the first place, but the giving of it for long periods when the process is not improving, nay, in many instances, with vision becoming poorer? And yet I have repeatedly seen tuberculin kept up when, certainly, had we been dealing with any other drug or disease, we would have acted differently. Only recently such a patient put on iodides and a daily slight elevation of temperature by putting his arms into very hot water for fifteen minutes, improved, and remarkably so, for the first time in a year. Here, too, may be mentioned the error of looking forever for the etiology of, say, an exudative sluggish recurring iritis: out go all focal infections; the Wassermann is negative; and tuberculin is used and the patient appears at innumerable conferences and demonstrations. Meanwhile, it has not occurred to anyone to shorten the process, in many cases even to stop it, by an iridectomy done in a quiescent interval. Some of my most grateful results have been cases of this type, though to this day I do not know what the etiology was.

A very small selection of drugs will go a long way in ophthalmology. Hoping frantically from one to many will not get us very far. Individualizing in the percentage used of a small number of standard drugs is better. To illustrate with pilocarpine: I have seen a 2-percent solution hold tension below normal but be painful and interfere with vision; a 0.5-percent solution served this patient just as well and there were no complaints. Occasionally a regulation of tension can be secured with a 6- to 8-percent solution of pilocarpine when weaker solutions have failed.

A word regarding dionin. Some patients sneeze after its use. I was shown a patient who in so doing immediately noted poor vision, the result of fresh retinal hemorrhages. I have seen the same result after diathermy. Be careful then to instruct people with arterio-

sclerotic vessels and hypertension to press on the tear duct for some minutes after the use of dionin.

Ringer's solution has proved useful to me in a variety of corneal dystrophies. These patients often complain of "dry" eyes. One patient of mine could not and had not wept for years. She was seen in consultation by Professor Lindner, who sent her home to smell onions! When this did not work, to eat horse radish! This having failed, to drop Ringer's solution in her eyes very frequently, which resulted in greatly increased comfort. This leads me to believe that we are committing an error in not buffering solutions to the pH of the tears, in many cases; and while I have not yet done so, I will try it.

Personally, I consider it a waste of time, therefore an error, to use vaccine therapy in cases of staphylococcal blepharitis and the recurring forms of hordeolum. Success is certain here, if we inject novocaine along the hair roots, pull out all infected ones at one session, dip a toothpick in 1-percent silver nitrate and insert it in the infected openings, and then follow with two to three applications from the water-cooled quartz lamp. To consider every chronic, slight but annoying, conjunctivitis a sequence of bacterial infection is an error: a number are undoubtedly of allergic origin and the more they are treated, the worse they become. Do not forget the value of amyl-nitrite, used cautiously in older people, not only in severe cases of ophthalmic migraine, but in the atrophic stages of some cases of chorioretinitis, in pigmentary degeneration of the retina, and in arteriosclerotic atrophy of the optic nerve. Cordes and Horner have recently shown the value in toxic amblyopias of the use of vessel-dilating drugs, such as sodium nitrite. Finally, as regards therapeutics: please remember that we are playing a duet with our patient. We may be first fiddle, but if we are drowning out our second fiddle let us ease up on our treatment and give him time to recover from our too energetic tone: sometimes a pause for a few days helps the second fiddle enormously.

The field in which errors are most

to be excused is perhaps that of glaucoma: excused to ourselves, at any rate, because after all we can say, "As long as I do not know why this eye is harder than normal I can only guess with a certain percentage in my favor as to what is wisest to do." Provided we employ common sense in estimating the age of the patient and expectancy of life, whether the disease is chronic with relatively low tension or acute with rather high tension, we have only one comparatively new method by which to avoid a good many of our former errors. I refer here to the curve of tension as ascertained by taking five or six tensions a day for several days, preferably with hospitalization, so as to obtain an even psychological background. This curve will show us the period, usually the morning, of the highest tension and the period of the lowest, when measured on the untreated eye, and will furnish us with the proper basis for the use of miotics and at what time they are to be administered. The curve is most useful when compared with the curve of the unaffected eye, if such there be. It also brings out one most important feature, and that is the normal tension for the particular individual, at least in cases in which a comparison between a normal eye and an affected eye is possible. After successful operation the taking of these curves every six months is to be advised. We see eyes slowly lose vision a year or two following an operation which at the time reduced pressure successfully. An occasional taking of the tension months or years afterward may not disclose a period of the day when the tension may have been nearly as high for a few hours as it was before operation. Let us not in referred cases from other specialists fall into the error of accepting their fields and their report of the tension as being representative of what that patient's tension and fields may be when we see them. I recently saw a patient well under pilocarpine who had traveled 24 hours previous to seeing me and carried with him a letter from his very competent eye specialist. This letter stated that the tension had never been more than 30 McLean. I took the tension to find it 90. When the patient

had recovered from the fatigue of the trip and the psychological excitement of seeing a new physician, it was 30. The difference in the measures, however, indicated that this case probably rested on a vasomotor basis and that the continuation of pilocarpine and a quiet life was preferable to an operation—especially as this patient's expectancy of life was not great. It is an error not to operate on the worse eye even though it be blind and painless. Valuable lessons can be learned as regards both patient and method of later operating on the one useful eye. Having said that errors in glaucoma are the most excusable among those we make, we need not pursue the subject further.

Cataract operations are a different story for the younger members of the profession today from what they were for those of my age when we started practice. Today sudden emergencies, with need for quick judgment, cases in which an error in judgment means loss of the eye, do not occur frequently. How well I remember uncontrollable sudden blepharospasm, ocular-muscle spasm, and sudden looking up, with the result that gaping wound and the operative field were under the upper lid. Here the lightning-quick operator and the man of many operations was in demand. The change is due to akinesis, retrobulbar injection, and superior-rectus suture. It is an error, and a grievous one, for anyone to operate today without using these measures with confidence. If you have not learned them, do so. If you won't use them, send your cataract patients to someone who will. It is an error to try every case as an intracapsular extraction. It is an error if when doing an intracapsular extraction you combine it with a total iridectomy. It is an error to excise or cauterize every iris prolapse: some can be replaced, others should be let alone. It is an error to believe that every focal infection in old people has to be removed before operating for cataract. It is an error to believe that perfectly normal light projection means a roughly normal fundus. I recently operated on an eye having normal tension with splendid projection and with the only indication of abnormality the fact that,

according to the patient's statements, the cataract had matured in three months so rapidly that he was reduced from coarse reading vision to blindness. I found a total detachment of the retina, not due to the operation; for Dr. John Weeks, acting as consultant, had noted a beginning detachment over two years ago. For many good reasons the man had never been told and did not tell me that Dr. Weeks had any records of his case.

What of specific errors not uncommonly made, not in spite of highly technical equipment, but because of it? A common example is the use of the high-power objective of the slitlamp before a general survey has been made by means of good focal illumination and ordinary magnifying equipment. I once missed a tiny perforation of the iris as evidence of an intraocular foreign body. One has a highly magnified but small field and can miss seeing a portion of it altogether.

When operating for strabismus it is an error not to use the O'Connor cinch-shortening method in the cases in which shortening a muscle is indicated. Other operations are good; this is the best. In alternating cases, have the patient fix with each eye in alternation and close both eyes after fixation, repeating this several times. If, on opening both eyes, one eye fixes after it has received the last visual impression, and the other one does so not at all or less frequently, operate first on the eye that has not maintained fixation well. Frequently, if there is not too great a degree of strabismus, this is the only operation required.

Finally, a few observations without any particular logical relation to each other: Do not publish cases of interest too early. You may find a year after such publication that the case was not what you thought and did not in any way turn out as you described it. Be chary in giving a hopeless prognosis, not only from a psychological aspect but because, not infrequently, your patient, to his joy and your mortification, is seen a few years later with better sight than he had had for a long time. Do not in fundus examinations, no matter how diseased the fundus, think that

there is no use wasting time in seeing what glasses will do. I have had my competent associate give a patient 10/10 in spite of the fact that from one look at his fundus I would have sneered at the thought that a glass would be of any benefit. Do not make a prognosis to yourself as regards vision on only one method of examination. It is astonishing how different, for instance, a cataract will look when seen with the ophthalmoscope as compared with the view through the slitlamp. In one case you see no good reason for much depreciation in vision, in the other case, expect very low vision; and the vision may lie somewhere between these two extremes. Do not judge the future regarding vision by the atrophy of the optic nerve, especially in children. The prognosis looks poor and yet you see them often as adults with 20/30 vision. Do not be too hopeless about restoration of useful vision at sometime just because the fundus is acutely and severely affected. It is amazing to see what an amount of restoration to normal anatomy with normal vision can occur in marked choked disc and in marked fresh retinitis from practically any cause. Do not, because of typical star-shaped exudate in the macula, speak of nephritic or hypertension retinitis. I have seen this star-shaped exudate in brain tumor. Similar cases are mentioned in ophthalmic literature. While it is wise and proper to be skeptical, at least, regarding the cure by Christian Science of what is clinically

undoubtedly melanosa of the choroid, do not forget that there are definite cases on record, substantiated by excellent men, of the self-healing of cases of sympathetic ophthalmia, tuberculosis, cataract, and so forth, and that it is never wise to say this or that cannot occur.

The loss of patients due to errors on our part can in many cases be avoided by analyzing our training and disposition, by regulating the amount of work we can do carefully, by refusing to be hurried, and by always considering ourselves as students and not finished masters of our subject. Some loss in practice of course is beyond our control. A patient of mine went to one of my confrères for a cataract operation and told him that she wanted him to operate on her cataract because a friend of hers had had her eye successfully removed by him. It is a human and humorous reasoning process and much as we may learn to control ourselves, we cannot control our patients' cerebrating processes.

The value of this paper has undoubtedly been greater for me than for you. As I wrote it the number of errors I commit rose up before me like a well-martialed army, too many to mention in this paper. But it has made me conscious of my faults, and that is helpful. If in reading this paper it brings all of your errors before you, it perhaps has served its purpose.

Stanford University Hospital.

THE RELATION OF ACCOMMODATION TO THE SUPPRESSION OF VISION IN ONE EYE

GLENN A. FRY, PH.D.
SAINT LOUIS

The present work is a continuation of that undertaken by McDougall and represents an attempt further to differentiate the factors involved in the voluntary suppression of vision in one eye. The rate of rivalry between afterimages induced in the two eyes, and between images produced by direct stimulation, can be affected by changes in accommodation. These effects can be obliterated by paralyzing the ciliary muscles with homatropine or by using a small artificial pupil which minimizes the effect upon the blurredness of the retinal image. From the Department of Ophthalmology, Oscar Johnson Institute, Washington University.

This investigation was made possible by a grant from the American Academy of Ophthalmology and Otolaryngology.

The present paper deals with a continuation of the type of work undertaken by McDougall in 1903.¹ McDougall showed that if one of the eyes is paralyzed with atropine, the ability to favor one of the monocular impressions in binocular rivalry is partially lost. This type of work was resumed by W. R. George and the writer while they were working together under Professor McDougall's supervision in 1932, and to Dr. George belongs the credit for a considerable amount of the preliminary work which forms the basis for the present paper.

The difficulty lies not so much in demonstrating that accommodation provides the basis for the voluntary suppression of vision in one eye, or the favoring of vision in the other, but in determining the exact manner in which this effect is accomplished. It might be produced in three ways: (1) through changes in the blurredness of the optical image, (2) through changes in intraocular pressure, and (3) through facilitating or inhibitory effects produced by proprioceptive impulses from the accommodation muscles upon the impressions from the retinae.

The use of afterimages instead of images produced by direct stimulation presents a situation in which optical blurredness is not involved. Under these conditions one is still able to retard or accelerate the rate of alternations between the dextrocular and sinistrocular impressions, as is demonstrated by the following experiment: The subject fixated the center of a bright horizontal bar (1" x 3") in a

dark field with the right eye for 20 sec. and after a lapse of 10 sec. fixated the center of a vertical bar with the left eye for 20 sec. The positive afterimages were observed in complete darkness, the dextrocular and sinistrocular impressions appearing alternately. These fluctuations were recorded on a kymograph drum by letting the subject press a key controlling a signal marker. Six separate observations were made with the eyes normal, the subject trying to retard and accelerate the rate of fluctuations in alternate observations.* The eyes were then paralyzed with homatropine and six similar observations were made. The results are given in table 1. Each

Table 1.

SHOWING THE EFFECT OF THE VOLUNTARY CONTROL OF ATTENTION UPON THE RATE OF ALTERNATION BETWEEN MONOCULAR IMPRESSIONS PRODUCED BY AFTERIMAGES IN THE TWO EYES. (ALTERNATIONS PER MIN.)

Eyes Normal		Eyes Paralyzed.	
Attempted Acceleration	Attempted Retardation	Attempted Acceleration	Attempted Retardation
23 ± 2.66	13 ± .66	15.4 ± 1.8	13.4 ± .8

value represents an average for three one-minute periods of observations. The bright bars used to induce the

* In trying to prolong the visibility phase of one eye the subject tries to concentrate his attention on the impression which is visible at the moment, but if he wants to make it disappear and bring on the other impression, he tries to imagine the other impression.

afterimages had a brightness of 3600 c. per sq. ft.,² and were observed through ficial pupils 2.33 mm. in diameter.

As the tabulated results show, one can by voluntarily controlling his attention change the rate of alternations from 13 to 23 per minute, but this effect is practically abolished when the eyes are paralyzed.

Although the use of afterimages rules out optical blurredness, the above experiment does not differentiate between the parts played by changes in intraocular pressure and proprioceptive impulses. In order to demonstrate that

the right eye when the right-eye image was present, and on the left eye when its image was present one could retard the rate to 14 alternations per minute.

Afterimages differ from primary images in this respect, that they periodically disappear even when observed with one eye. For example, if an afterimage similar to those used in the above experiments is induced in one eye only, every 8 or 10 seconds it will disappear for a short period of about 2 to 4 seconds. Fry and Robertson² have shown that these disappearances depend upon the obliteration of the im-

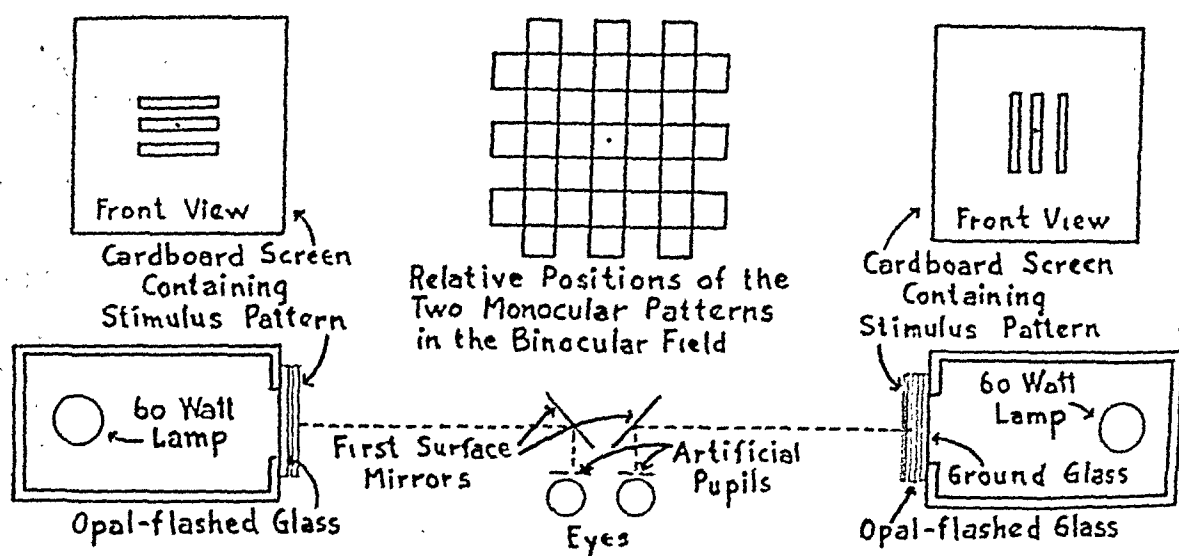


Fig. 1 (Fry). Apparatus for investigating the binocular rivalry of bars crossing each other. The images of the two stimulus patterns are seen reflected in the two first surface mirrors. The dots in the center bars serve as fixation marks and the mirrors are adjusted to compensate phoria. The bars are $1\frac{3}{4}$ in. long, one-fourth in. wide, and one-fourth in. apart. The stimulus patterns are 13 in. from the mirrors, and the mirrors 2.5 in. from the corneas.

changes in intraocular pressure alone are capable of changing the rate of alternations, the following experiment was performed. Afterimages of horizontal and vertical bars were used as in the previous experiment and the eyes were paralyzed. By pressing on the closed eyelid of the left eye with the fingers when the image of the right eye appeared, one could make the image of the right eye quickly give way to the image of the left. The appearance of the right-eye image could then be made to reappear by pressing on the right eye. In this way a rate of about 26 alternations per minute could be obtained. When, however, one pressed on

pressure at the retinal level and that by controlling his attention one can increase or decrease the frequency of these disappearances when the eyes are normal, but not if the eyes are paralyzed with homatropine. To what extent the binocular rivalry is affected by the periodic obliteration of the impressions at the retinal level has not been carefully investigated, but the facts are plentiful enough to make one suspect that the changes in intraocular pressure produce their primary effect upon the periodic obliteration of the impressions at the retinal level, and that this in turn affects the rate of alternation in binocular rivalry.

Even in the case of impressions produced by direct stimulation, if an object differs only slightly in brightness from its background, the retinal impression will be obliterated periodically. But the difference can be made great enough so that the retinal impression will be stable, and periodic obliterations at the retinal level cannot be involved in the alternations in binocular rivalry.

Although changes in intraocular pressure affect the binocular rivalry of afterimages, this factor can be demonstrated to play little or no rôle in the suppression of vision in the case of impressions produced by direct stimulation. For investigating the rivalry of

eter, and six other records were obtained with the eyes paralyzed and artificial pupils 3.94 mm. in diameter. The results are shown in table 2.

Although one is able to change the rate of alternations from 48.6 per minute to 28.4 per minute when the artificial pupils have a diameter of 3.94 mm., this ability is almost completely abolished when the pupil diameters are reduced to 2.06 mm. The most plausible explanation for this is that the small artificial pupil prevents changes in accommodation from producing marked effects upon the blurredness of the optical image, but it does not interfere with the changes in intraocular pressure or

Table 2

SHOWING THE EFFECT OF THE VOLUNTARY CONTROL OF ATTENTION UPON THE RATE OF ALTERNATION BETWEEN MONOCULAR IMPRESSIONS PRODUCED BY DIRECT STIMULATION OF THE TWO EYES (ALTERNATIONS PER MINUTE)

Eyes Normal				Eyes Paralyzed	
Art. Pupil 3.94 mm. in Diameter		Art. Pupil 2.06 mm. in Diameter		Art. Pupil 2.06 mm. in Diameter	
Attempted Acceleration 48.6 ± 4.8	Attempted Retardation 28.4 ± 2.8	Attempted Acceleration 42.6 ± 7.8	Attempted Retardation 39.6 ± .4	Attempted Acceleration 45.4 ± .8	Attempted Retardation 40 ± 2

impressions produced by direct stimulation, the apparatus in figure 1 was used, which makes it possible to present a group of three horizontal bright bars in a dark field to the left eye, and a similar group of vertical bars to the right eye. The brightness of the bars was set at .75c. per sq. ft. The two groups of bars are seen alternately, and a record of the alternations for one-minute periods can be made on a kymograph drum. With the eyes normal and artificial pupils 3.94 mm.* in diameter placed before them, records for six separate observation periods were obtained. In alternate observations the subject attempted to accelerate and retard the rate of fluctuations. Six similar records were obtained with normal eyes and artificial pupils 2.06 mm. in diam-

the proprioceptive impulses, so that it cannot be assumed that these factors play an essential rôle. As can be seen in the tabulated results, the ability to change the rate of alternations is also abolished to a large extent by the use of homatropine.

Summary and conclusions

The voluntary suppression or favoring of vision in one eye has been demonstrated to be mediated through changes in accommodation by showing that the voluntary control is abolished by paralyzing the ciliary muscles with homatropine. In the case of afterimages the control is brought about through changes in intraocular pressure because optical blurredness is not involved, and because it can be shown that applying pressure to one of the eyes causes the impression of that eye to predominate over that of the other eye. In the case

* Under the conditions of the experiment the size of the natural pupil is about 5 mm. in diameter by actual measurement.

of the rivalry of impressions produced by direct stimulation, the voluntary control is mediated through changes in the blurredness of the optical image, because voluntary control is abolished by use of a small artificial pupil, which minimizes the effects of changes in accommodation upon optical blurredness but does not interfere with proprioceptive impulses or changes in intraocular pressure.

The demonstration that the voluntary suppression or favoring of vision in one eye is mediated through the ciliary muscles is of theoretical importance because Helmholtz³ used this phenomenon as evidence against Müller's doctrine that paths from corresponding points of the two retinæ converge upon common cerebral pathways. He believed that the paths from corresponding points of the two eyes remain separate up to the point to which consciousness is adjunct and that the integration of the two monocular impressions is a psychic affair, and the suppression of one of the impressions

is simply a matter of the mind's ignoring it. Now if the voluntary control is effected through peripheral mechanisms, this vitiates Helmholtz's objection to the doctrine of common cerebral centers.

The discovery of the particular mechanisms involved in the voluntary suppression of vision and of methods for controlling suppression should be of practical importance in the treatment of squint, but procedures utilizing this knowledge have not as yet been worked out.

The demonstration that voluntary control of binocular rivalry can be abolished by such means as mydriatics and artificial pupils is of practical importance to those who are interested in the investigation of binocular phenomena, because if proper precautions are taken they need no longer fear that uncontrolled changes of attention will lead to spurious results.

Dept. of Physics, Ohio State Univ.,
Columbus.

References

- ¹ McDougall, W. Physiological factors of the attention process, III. *Brain*, 1903, v. 12, pp. 473-488.
- ² Fry, G. A., and Robertson, V. M. The physiological basis of the periodic merging of an area into its background. *Amer. Jour. Psych.*, In press.
- ³ Helmholtz, H. von. Physiological optics. American ed., 1925, v. 2, p. 499.

THE NONSURGICAL TREATMENT OF NONPARALYTIC STRABISMUS

SAMUEL V. ABRAHAM, M.D.
LOS ANGELES

This presentation is based on a study of cases of strabismus with and without amblyopia and cases of amblyopia without strabismus. Emphasis in treatment is placed on the general health especially in early cases. The difference between the presence of a fusion faculty and the demonstration of good fusional activity is emphasized. The value of equal ocular efficiency is stressed. The question of the relation of the error of refraction to the incidence and treatment of strabismus is discussed. Minimal errors of refraction are tentatively submitted, below which prescription for the effect on the strabismus is of very questionable value. No attempt is made to give statistics of successes and failures, but only to inquire into the probable causes therefor. Read before the Eye, Ear, Nose and Throat Section of the California Medical Association at the sixty-fourth annual session at Yosemite National Park, May 13-16, 1935.

This paper presents the results obtained from analyzing the records of 66 cases of nonparalytic strabismus without ocular pathology, 23 cases of nonparalytic strabismus with ocular pathology, and 200 nonpathologic cases of unilateral and bilateral amblyopia without strabismus. Twenty-one of the strabismic cases were seen during the past year at the White Memorial Hospital Eye Clinic. The remaining 268 cases were seen in private practice during the past three years. In this presentation it is not intended to give the statistics of successes and failures, but to inquire into the probable causes therefor.

Most reports on this subject present the results of nonsurgical therapy in percentages based on those cases, and only those cases, which have satisfied the particular author's requirements as to the period of treatment. In the recent reports by Guibor¹,² and Feldman,³ one finds that at least an equally large number of patients have failed to continue the treatment more than several weeks or several months. These cases are not considered in the final percentages, despite the fact that a great number of them should be considered as failures. It is probably a lack of material improvement in their condition which led to the discontinuance of the treatment in many instances. If all patients who start treatment are considered, the percentages of good results would be much lower than those usually given. That all cases should be included will be argued by those who obtain prompt signs of improvement, while those who set 6,

12, or more months as arbitrary periods of required treatment will naturally object.

It is desired here to point out that the failures may be due to the indiscriminate application of a standardized mode of treatment to cases of all types. It is hoped that a clearer understanding of the specific requirements in each case and the application of the particular therapeutic measure or measures indicated may lead to better and more prompt results with the minimum of fruitless effort. The essential factors to be briefly considered here are not new. The aim is only to emphasize a more rational viewpoint.

I. General health

While the general health is considered of considerable importance by many authors, few clinicians accord this subject the primary position it seems to deserve. Disturbances of the general health are, in the writer's opinion, not only of primary importance in inciting a strabismus in early life, but may cause recurrences or prevent a good response to therapeutic measures. Only recently, several authors have called attention to the close relationship between the general health and the strabismus (Feldman,³ Pugh,⁴ Dor,⁵ and Csapody-Mocsy.)⁶ It is desired here to report briefly three cases which further illustrate the importance of the health factor in the treatment as well as in the etiology.

In all cases presented cycloplegic tests were made. The angles of squint as given were determined for distance

fixation in the primary position. The angle Gamma was considered in each case. A squint was considered intermittent if the history so stated or if single binocular fixation was noted at some time during the examination (first three visits). A squint was considered alternating in type if with eyes open, fixation could be maintained with either eye, even if preference for one eye existed.* Worth's classification of fusion was followed, as no reason could be found for a change. Type-I fusion refers to the finding of simultaneous binocular vision (diplopia). This was found in every nonpathologic case of strabismus examined, although frequently with special aids, and is in agreement with Maddox⁷ who believed that an absent fusion faculty is rarely found. Type-II fusion refers to the finding of ability to blend images. Type-III fusion refers to the ability to obtain stereopsis and to maintain it under varying conditions (amplitude).

Case 1. A. H., a male, aged 10 years, had had intermittent alternating divergent strabismus varying in amount up to 35 degrees since he was one year of age. R.V. w + 0.50 D. cyl. ax. $90^\circ = 1.0$; L.V. w + 0.25 D. sph. \approx + 0.50 D. cyl. ax. $90^\circ = 1.0$. Type-III fusion was present. The family history was negative for strabismus. The mother had interstitial keratitis. This patient had been a premature baby. *Taenia saginata*, considered to be at least three years old, was recovered from the intestines. Following the removal of the parasite the eyes immediately began to improve, and the patient gained seven to nine pounds. Two weeks after recovery of the tapeworm the "eyes turned only occasionally." Divergence was rare thereafter and when the patient was seen almost five months later no squint had been present for at least two months. No glasses nor fusion treatments had been given this patient. In all, the fusion sense had been examined six times and was found pres-

ent at all times. This case could be considered also (as it no doubt is) as an example of surrender of convergence effort. It is not desired here to discuss the relation of convergence and strabismus.

Case 2. M. K., a female, aged $3\frac{1}{2}$ years, had had intermittent convergent strabismus, almost always of the right eye, during the past year and one-half. While it had not been observed after a tonsillectomy six months before examination, it had again become noticeable during the past four to six weeks. Convergence was found to be present under cover. R.V. w + 3.00 D. sph. \approx + 0.25 D. cyl. ax. $90^\circ = 0.3$; L.V. w + 3.00 D. sph. \approx + 0.25 D. cyl. ax. $90^\circ = 0.5$. (Vision was probably better but the patient's attention was not sustained.) Type-II fusion was definitely present, probably Type III also, but cooperation was still insufficient to allow of making definite statement. The patient was definitely listless. Physical and laboratory examinations by a pediatrician revealed only a slightly subnormal hemoglobin (75 percent). The mother reported that the child ate less than one third of the prescribed diet. This defect was remedied to a great extent and with a prompt decrease in the appearance of the strabismus. The mother kept a record of the number of times per week a squint was noticed. Following improvement in food intake the record showed a definite decrease. In the fourth month the strabismus was rarely noted. The hemoglobin was then 85 percent.

The minor part that fusion played in these cases is evident from the response obtained without fusion therapy. While glasses may justly have been prescribed in this second case, they were withheld to permit demonstration of the greater importance of the general health.

Case 3 emphasized the health factor even more as in it we have a relatively "young," normally active fusion faculty in which the condition was well known before the onset of the strabismus.

Case 3. B. S., a female, aged 13 years, had had alternating convergent strabis-

* Since such cases showed equal or almost equal visual acuity in the two eyes, and fixation with each eye could be maintained, it was considered probable that alternation was at times present.

mus of 30 degrees since the age of $2\frac{1}{2}$ years. Glasses had been worn since she was $5\frac{1}{2}$ years of age, and orthoptic training was given soon after for one year without effect. Only Type-I fusion was demonstrated before the operation, but eight days after the operation, when the patient had been 24 hours without a bandage, Type-III fusion was easily elicited. R.V. w + 0.75 D.sph. \approx + 1.25 D. cyl. ax. 30° = 0.8; L.V. w + 1.00 D. sph. \approx + 0.25 D. cyl. ax. 90° = 0.8. It was thought that glasses were not vitally important, so they were not prescribed. Fusion exercises were given at home and at the office to help in the development of the "young" fusion sense. Six months passed without any evidence of strabismus. Then, following an attack of influenza, a right convergence became evident. The patient was seen three weeks after the onset. After three more weeks, during which fusion was more intensively stimulated (or convalescence became complete), the squint promptly disappeared, and the eyes functioned normally at least six months later. Type-III fusion was easily elicited during the period when the temporary squint was manifest.

In this case the prompt disappearance of Type-III fusion within 24 hours after surgery suggests that this type of fusion was present before but could not function, that is, could not be clinically demonstrated because of the inability to get similar images on corresponding points. The fact that Type-III fusion was elicited by a special test during the period of convergence of the right eye following the attack of influenza shows, too, that the strabismus was not due to a lack of fusion sense but to a lack of energy to *maintain* this function. This case suggests that although fusion by tests may be normal, yet the length of time this cerebation process has been active determines the readiness with which it may be surrendered when the general health (and energy sources) suffer. That more attention should be paid to stories of general-health disturbances is strongly suggested by the relapse occurring in this case following influenza. The prophylactic value of stimulating

the fusion function during the convalescent period is self-evident. The likelihood of avoiding such complications as amblyopia and abnormal muscle responses would be increased. Avoidance of physical or mental excesses would no doubt be helpful during this period.

A study of 10 cases of intermittent strabismus showed that a disturbance of the general health was found in five of these despite the long duration of the condition. When the health was improved the strabismus disappeared. However, one is not usually fortunate enough to find a health factor present after the strabismus has existed for several months or more.

II. Error of refraction

Since Donder's emphasis on the relation between the error of refraction and strabismus, it has been customary to prescribe glasses at an early age without sufficient regard to their frequent lack of effect. The psychologic problem introduced for the patient and the parents by this procedure has been entirely disregarded. As little as one or two diopters of hyperopia are frequently corrected in strabismic children. No consideration is given to the relative unimportance of this small amount of hyperopia to the amount of accommodation available. Little attention is paid to the lack of organic relation between accommodation and convergence, and to the ease with which these functionally related acts may be dissociated. No justification for this procedure has ever been presented. The statistics of cures with glasses alone do not furnish the data necessary to determine the minimal limits of refractive errors which may be ignored in caring for the strabismic patient (Guibor and others). The idea that in the early period of the strabismus, or even before its onset, a small factor may turn the balance against the strabismus seems sound and, on the basis of this idea, apparently justifies prescribing for small degrees of hyperopia. This reasoning fails to consider the aforementioned lack of importance of the small amount of hyperopia to the amount of accommodation available, as well as the usually

small amount of time spent in exacting close work in these young individuals. The aforementioned lack of organic relation between accommodation and convergence as well as the ease with which these functions may be dissociated are further arguments against the idea presented. Those who believe in prescribing for small amounts of hyperopia in treating strabismus have yet to produce clinical support for this belief.*

In a study of unilateral and bilateral amblyopia with and without strabismus, recently reported upon by the writer,⁶ it was suggested that when the error of refraction is high, correction by accommodation is not easily tolerated. Following the neurologic principle that an intolerable function is usually surrendered, accommodation in these cases does not counterbalance the error of refraction; hence, later on, these patients show a lack of visual development—a subnormal corrected acuity of vision, definitely related to the high error of refraction. The relation of these errors to the strabismus that may be present cannot, therefore, be considered due to any accommodation-convergence link. Zentmayer's⁹ studies of refraction in convergent strabismus show an increased incidence of high errors of refraction in strabismus as compared to the findings in nonstrabismic cases. His statistics suggest that patients with high errors of refraction are more prone to have strabismus. In view of the above-mentioned findings in amblyopia and in strabismus, it seems reasonable to presume that the relatively greater frequency of strabismus in cases with high errors of refraction may be directly related to the decreased visual efficiency. It is tentatively suggested, therefore,

that the following errors of refraction be given consideration in the treatment of strabismus: (1) hyperopia of 3.00 diopters or more; (2) astigmatism of 1.50 diopters or more; (3) anisometropia of at least 2.00 diopters.

Of nine patients cured by glasses alone, none had an error of refraction less than the minimal figures just given.*

This article is not concerned with the relation of the size of the squint angle to the response to therapy, although it cannot be denied that this is a probable factor. Cases responding to correction of refraction alone have shown a wide variation in the size of the squint angle, but too few data are at hand to justify a definite statement on this point.

The type of case requiring correction of the error of refraction is well illustrated in the following cases:

Case 4. H. L., a male, aged seven years, had alternating convergence varying from 10-35 degrees. Onset was at the age of three years following a fright. R.V. w + 5.50 D. sph. \approx + 0.50 D. cyl. ax. 180° = 1.0—L.V. w + 5.50 D. sph. \approx + 0.50 D. cyl. ax. 90° = 1.0. The eyes were straight at once with glasses. Four months later, the first test for fusion showed the presence of Type III. The eyes now are sometimes straight without glasses.

Case 5. H. D., a female, aged six years, had a left convergence of 15 degrees since the age of four years. R.V. w + 5.00 D. sph. = 0.6. L.V. w + 4.50 D. sph. \approx + 1.00 D. cyl. ax. 110° = 0.2. The left convergence was less under atropine. The eyes were straight with glasses when seen one month later. Ten months later, the eyes were still straight with glasses, although there was a tendency to alternate convergence without correction. Corrected, the vision O.U. = 0.6—.

Case 6. W. M., a male, aged 4½ years had had a left intermittent convergence for the past two years. The angle of squint varied up to 20 degrees. R.V. w + 4.50 D. sph. \approx + 1.50 D. cyl. ax. 110° = 0.3? L.V. w + 5.00 D. sph. \approx + 1.50 D. cyl. ax. 70° = 0.3—? The eyes were straight under atropine, and had remained straight with glasses.

* Since presentation of this paper the excellent paper by A. M. Hicks and G. N. Hosford appeared (*Orthoptic treatment of squint*, Arch. of Ophth., 1935, v. 13, June, p. 1026). In this they, too, emphasize the limitations of orthoptic training. Of 24 cases, the only five in which the eyes were straight following orthoptic training were straight with glasses only. These showed an error of refraction of at least 3.00 diopters of hyperopia.

when last heard of, eight months later.

When high errors are corrected without materially influencing the strabismus it will be found that visual and muscle or innervational complications have already developed. This is illustrated by the following two cases:

Case 7. E. H., a female, aged 26 years, had had a left convergence since her third year following illness with convulsions. Glasses were worn at five years. Although there had been some spontaneous improvement in the strabismus since she was 12 years old (seven years after starting to wear glasses), 5-25 degrees of left convergence (variable) was still present at the examination. R.V. w. +2.00 D. sph. \approx + 1.50 D. cyl. ax. 90° = 0.8. L.V. w. + 1.50 D. sph. \approx 3.50 D. cyl. ax. 90° = 0.2 — 1. Only Type-I fusion was demonstrable. A large left central scotoma almost reaching the fixation point was present. The results might have been different had the glasses been prescribed promptly when the squint first manifested itself.

Case 8. J. H., a male, aged seven years, had a left convergence (45 degrees) present since the age of two years, following several serious falls. He was given two years of orthoptic exercises, including occlusion of the right eye and drawing with the left eye. R.V. w. +4.50 D. sph. = 0.8 + 3. L.V. w. + 4.25 D. sph. \approx + 1.00 D. cyl. ax. 80° = 0.4 — 1. Glasses were without effect on the squint. Only Type-I fusion was demonstrable. The squint angle at times was only 20 degrees. The patient did not cooperate well. An operation was performed. On the ninth postoperative day, after 24 hours without bandages, Type-III fusion was found to be present. Glasses were ordered equalizing the right and left vision. Fusion treatment could not be effectively given. Glasses had not been given until the strabismus had been present one year. No treatment of moderately thinned, stretched external recti (as found at operation) had been instituted. It is possible that if glasses had been prescribed promptly the left subnormal vision would have been avoided and the muscles would have

maintained functionally equal development.

III. Unequal visual efficiency

If the retinal images are different in size or clarity in the two eyes, whatever the cause, it cannot be expected that the two eyes will function normally together. Normal fusional activity depends on the presence of markedly similar images of the same object in the two eyes. This was recently emphasized by Little's¹⁰ case of unilateral aphakia with divergent strabismus, which was corrected by a contact glass. Duane,¹¹ in 1899, Deloge,¹² in 1921, and Blatt,¹³ in 1932, also reported correction of strabismus by better equalization of vision in cases of marked anisometropia. The recent work of Ames¹⁴ and his co-workers calls fresh attention to the importance of balancing the lenses before the eyes so that the two macular images are more nearly equal. The question which he has raised of an actual retinal asymmetry is far from settled. A discussion of this phase of the subject is not essential to this paper.

When the inequality in visual efficiency is not fully explained by the anisometropia that may be present, the condition (the unilateral amblyopia) is due to the strabismus—is one of its sequelae. This should receive consideration before an attempt at fusion therapy is made, for any fusional activity that may be developed in the presence of amblyopia is abnormal and may not be maintained. It is probably this factor that accounts for a decrease in Guibor's² good results with time. Feldman³ required 20/70 vision in the poorer eye before commencing fusion treatment.

IV. Muscles

Dunnington¹⁵ called attention to the finding at operation of thinned, stretched, or atrophic muscles. Contractures, too, may be found present in cases of strabismus. While many cases do not show such changes grossly, the inequality in functional activity should reasonably be expected to produce certain changes in the muscles involved. While abnormal fusion effort may indirectly help overcome this

muscle defect, a prolonged period will usually be required. The exercise of the fusion faculty that this involves should not be confused with *fusion treatment*. Cases 3 and 4 show that the fusion faculty needs little, if any, treatment when the muscle imbalance is corrected by surgery. Others have reported similar findings (Goar¹⁰).

Direct therapy aiming at the development of a more normal equilibrium of muscle power may possibly bring about prompt results without surgery. Such therapy may be along the lines of electrical stimulation of the weaker muscles, such as is given for muscles elsewhere in the body. Until this is done, however, one must consider non-surgical treatment of this complication as a prolonged form of therapy.

V. Fusion

Peter¹¹ said that fusion training may be a simple matter; that in many instances little is necessary, if the subnormal visual and suppression barriers are removed. Such an observation plus the excellent results without fusion therapy which usually follow the surgical correction of cases of alternating strabismus (case 3) and cases of unilateral strabismus with fair vision in the squinting eye (case 8) definitely force the statement that fusion is potentially present in most if not all cases of strabismus, awaiting only favorable conditions for functioning. A prolonged period of fusion treatment should suggest attention to the factors which make fusion activity difficult. The specific treatment of fusion may be deferred until these deterring factors are removed.

These deterring factors are unequal visual efficiency or muscular defects preventing normal coördinating activity of the eyes. When the inequality in vision is due to amblyopia *following* the strabismus, the treatment will be most prolonged unless this factor is corrected early in life. When muscular changes have taken place (actually in the muscles or in the innervation) the treatment by nonsurgical means should

be directed *towards the muscles, and not towards the fusion faculty*. In the absence of a visual deterrent, if the response to "fusion tests" improves promptly (within six to eight weeks), one can say that the muscle condition is not a marked deterring factor. A period of fusion treatment may be found helpful in old cases properly prepared therefor, and in recent cases which may benefit from extra stimulation. Such cases should show prompt "improvement" as evidenced by a greater ease in demonstrating Worth's Type-II or -III fusion.

Summary and conclusions

1. A few cases have been presented to demonstrate the value of the general health as a factor in the treatment of nonparalytic strabismus.

2. The importance of high errors of refraction and of definitely unequal ocular efficiency in determining the treatment of the condition was emphasized. Tentative minimal errors that should be corrected were given as 3.00 diopters of hyperopia, 1.50 diopters of astigmatism, and 2.00 diopters of anisometropia.

3. It was pointed out that the fusion faculty is probably potentially present in all cases of strabismus (at least simultaneous binocular vision Type-I fusion is demonstrable in practically all nonpathologic cases). It requires but a relatively short period of treatment for full expression if the deterring factors are first removed. It was suggested that fusion treatment may be relatively fruitless if these factors of inequality of visual efficiency and abnormal muscle responses are not first removed.

4. Indications are given for determining at the start whether or not non-surgical therapy will be prolonged.

5. The question is raised whether it is psychologically sound to undertake a prolonged period of nonsurgical therapy alone in certain cases when with surgery prompt results may be obtained (footnote, p. 142).

727 West Seventh Street.

References

- ¹ Guibor, G. P. Some possibilities of orthoptic training, etc. Arch. of Ophth., 1934, v. 11, March, p. 433.

- ² ———. Practical details in the orthoptic treatment of strabismus. *Arch. of Ophth.*, 1934, v. 12, Dec., p. 887.
- ³ Feldman, J. B. Orthoptic treatment of concomitant squint. *Arch. of Ophth.*, 1935, v. 13, March, p. 419.
- ⁴ Pugh, M. A. A classification of concomitant strabismus. *Brit. Jour. Ophth.*, 1934, v. 18, p. 446.
- ⁵ Dor, L. Strabismus and avitaminosis. *Arch. d. Opht.*, 1933, v. 50, Oct., p. 667.
- ⁶ Csapody-Moesy, M. A contribution to the pathology of concomitant strabismus. *Klin. Monatsbl. f. Augenh.*, 1934, v. 13, March, p. 385.
- ⁷ Maddox, E. E. Orthoptic treatment, etc. *Trans. Ophth. Soc. U. Kingdom*, 1931, v. 51, p. 296.
- ⁸ Abraham, S. V. A classification of amblyopia. *Arch. of Ophth.*, 1934, v. 12, Dec., p. 391.
- ⁹ Zentmayer, W. Squint. *Jour. Amer. Med. Assoc.*, 1910, v. 55, July, p. 118.
- ¹⁰ Little, M. F. Treatment of unilateral cataract with contact glasses. *Arch. of Ophth.*, 1934, v. 12, April, p. 646.
- ¹¹ Duane, A. Divergent strabismus cured by correction of myopia. *Ophth. Rec.*, 1899, v. 8, p. 179.
- ¹² Deloge, C. The nature and treatment of strabismus. *Amer. Jour. Ophth.*, 1921, v. 4, p. 407.
- ¹³ Blatt, N. Contact glasses in myopia. *Arch. of Ophth.*, 1932, v. 7, March, p. 399.
- ¹⁴ Ames, A. Jr., Gliddon, G. H., and Ogle, K. N. Size and shape of ocular images. *Arch. of Ophth.*, 1932, v. 7, April, p. 576.
- ¹⁵ Dunnington, J. H. The proper time for operation in strabismus. *Arch. of Ophth.*, 1933, v. 10, Oct., p. 438.
- ¹⁶ Goar, E. L. Alternating convergent squint. *Trans. Sect. Ophth. Amer. Med. Assoc.*, 1925, p. 50.
- ¹⁷ Peter, L. C. In discussion (p. 456) of Guibor's Orthoptic training. *Arch. of Ophth.*, 1934, v. 11, March, p. 433.

MANAGEMENT OF COMPLICATIONS IN THE OPERATION FOR SENILE CATARACT

DR. HARRY W. WOODRUFF
JOLIET, ILLINOIS

This paper gives a brief discussion of such operative complications as prolapse of vitreous, hemorrhage, and infection; also postoperative glaucoma, iris prolapse, retinal detachment, and sympathetic ophthalmia together with various suggestions for the inexperienced ophthalmic surgeon. Read before the American Academy of Ophthalmology and Otolaryngology in Cincinnati, September 17, 1935.

The progress that has been made in recent years should have lessened most of the complications in the operation for senile cataract; but changed technique in the hands of the less experienced may and does bring added dangers. There is, in fact, no single step in the operation that may not be the subject of controversy. When one sees the many sutures used in some cases and the more or less complicated mechanism, he may look with profit upon an old method in which capsulotomy and iridectomy were performed with the cataract knife while the corneal section was made, and the lens expressed by finger pressure through the lids. The few instruments used and the few seconds consumed in the operation invest this method with more than historic interest.

Many of the so-called minor complications that occur in making the incision are mostly the result of inexperience. The beginner should, therefore, practice the incision and iridectomy on pigs' and kittens' eyes until he can hold the eye with the double-fixation forceps in one hand and make the incision with the other without pressure on the globe.

He must early learn to appreciate the refractive displacement of the knife in the anterior chamber in order to make a proper counter puncture. He should not use the larger knives; the 32-mm. Graefe knife is best for him.

Most operators now prefer conjunctival flaps. Sometimes there is considerable bleeding from these flaps and blood may be drawn into the anterior chamber. The operation cannot proceed without removal of the blood either by pressure or anterior-chamber irrigation. This is not entirely devoid of danger; vitreous may be lost in the maneuver.

One of the most serious major dis-

asters is the sinking of the lens into the vitreous. This is more liable to occurrence with the Barraquer suction method of operation. It has happened to me and I have seen it happen to others. While the lens rises up again and can be removed with the loop, it is nevertheless a most serious complication.

Prolapse of vitreous. If the vitreous is fluid it will escape as soon as the incision is made. Here it would be well for the operator to follow the suggestion of Harold Gifford, who read a paper before this Academy in 1920 "On backing out of cataract operations."¹ He reported a case in a man of 48 years in which the fluid vitreous escaped in such quantity upon incision that he stopped the operation and dealt with the cataract later by several needlings, finally getting useful vision, which was maintained for five years. I have under my care now a similar case in which I wish I had followed Gifford's advice. My patient was 47 years old, and was known to have had vitreous opacities for some time, but had had good results with glasses until the beginning of sclerosis of the crystalline lenses. This process had advanced to such a point in the left eye that vision was reduced to less than 20/200, the loss of vision being due more to the irregular astigmatism in the lens than to opacity. The operation was performed November 26, 1933. Upon making the incision and after its completion there was such an escape of fluid that the globe collapsed. I removed the lens with the hook. After weeks of convalescence and a needling a retinal detachment was found which has since been operated upon with but slight success. It is almost certain that the sclerosing lens and vitreous opacities in the other eye are also accompanied by a fluid vitreous. I expect to

deal with it by repeated needlings, as suggested by Gifford, but dread the long period of time which it will require and the uncertainty of the final result. In reporting his case Dr. Gifford said his patient had lost all sight in the left eye by some form of vascular degeneration 15 or 20 years before. I believe this to be significant of tuberculosis or focal infection. My patient has definitely had antrum disease and I have not yet become satisfied that there may not still be ethmoid involvement.

The loss of normal vitreous in the cataract operation is an entirely different matter. Lancaster² has said that normal vitreous does not come out of itself. Twenty-five years ago Beard³ named squeezing of the lids on the part of the patient as the major cause. He also condemned overcocainization. Now we know that improved anesthesia and akinesia have been the most important factors in prevention.

I know of no bad results by the Van Lint method of lid injections and it is a certain preventive of spasmodic contraction of the orbicularis if properly introduced. The injection must be made deeply. It does not, however, prevent the nervous patient from moving his eyes about. If prolapse of vitreous occurs and a conjunctival suture has not been previously inserted, the eye should be closed at once. Any attempt to remove prolapsed vitreous or iris will result in more prolapse. If there has been a conjunctival suture so placed that it can be drawn up and tied with the lids closed, then some toilet of the wound may be possible.

One of my most serious cases of vitreous prolapse occurred just after the operation was finished. A nurse came suddenly into the room and asked me a question which caused the patient to turn his eye; a serious prolapse of vitreous resulted. In the hospital operating room quiet and freedom from distraction are essential. If there is a prolapse of normal vitreous before the lens is extracted, it is better to stop the operation and remove the lens at a subsequent operation. For some reason vitreous prolapse is not then so apt to occur. If one attempts to remove the lens with the spoon, he may lose more

and more vitreous unless he is very expert.

It is not alone the loss of vitreous, which, if slight, is not serious in itself, but the position in which it may leave the iris and capsule, should these remain in the eye. One may have either an updrawn pupil or a very large pupil either with the iris in the wound or retroverted, due to the subsequent contraction of the vitreous that has been in the wound and anterior chamber. In addition, there are nearly always obstructive vitreous opacities. Thanks to Lindner⁴ we now know that vitreous is not a culture media for the growth of bacteria.

Expulsive hemorrhage. This accident has occurred but twice in my experience in the cataract operation, but several times in operations for glaucoma. One of the cataract cases was reported in 1931.⁵ I did not then use retrobulbar injections of novocaine and adrenalin. In a series of cases of avertin anesthesia recorded by Miss Nichol, chief anesthetist at the Silver Cross Hospital in Joliet, the blood pressure was reduced in every case: when high (182), it was reduced to 100; when low (108), it was reduced to 66.

F. A. Davis⁶ of Madison referred to a case of reduction of intraocular tension from 60 to 0 during avertin anesthesia. It would seem that this might be the ideal method to prevent hemorrhage and perhaps other complications when one can secure at once such marked reduction in general blood pressure and also in intraocular tension. If expulsive hemorrhage occurs it is not advisable to remove the eye at once; as sometimes a normal globe may be retained.

Intraocular hemorrhage occurring after the operation can be arrested by the subcutaneous injection of adrenalin and ergot (Thilliez').

In cases of intraocular infection, if discovered within 24 hours, most eyes can be saved by the deep orbital injection of 8 or 10 min. of a solution of cyanide of mercury 1 to 1,000, with 4 min. of 4-percent cocaine added to prevent pain.

Very few operators think it wise to examine the eye on the day after the

operation. If the patient is so unfortunate as to have an infection he will probably lose the eye, as only early treatment is effective. The cases that I have lost because of infection were those in which I did not examine the eye the day after the operation. Some form of foreign protein is useful in prevention and treatment. It is assumed that in every case the conjunctival sac and the lacrimal sac have had attention. There should never be any intraocular operation if the culture is positive.

I was recently informed of a case in which laboratory examination showed 11 colonies of staphylococcus growths. Notwithstanding, the operation was performed and the eye lost from infection. Any focus of infection about the face, mouth, nose, or ears should receive attention. Lindner said he does not bother with a conjunctival culture preliminary to extraction.⁸

I once operated on a patient who had had a chronic conjunctivitis for several years; the eye could not be freed from secretions and a negative culture was never secured even after treatment lasting two years. Finally, in the presence of a conjunctivitis with abundant secretion manifesting bacteria of many sorts, extraction was performed. Daily intramuscular injections of 10 c.c. of aolan were given and the patient made an uneventful recovery. We have no means of knowing when the patient may possess immunity, or whether this treatment created immunity. However, at the time of the operation I frequently give injections of foreign protein.

No precaution should be omitted as to patient, surgeon, or operating room. Is there any reason why the ophthalmic surgeon should not follow the rules of general surgery as to dress, mask, and rubber gloves? The mask should cover the nose as well as the mouth. The surgeon will find on use that he can operate as well with rubber gloves as without. Only prejudice keeps us from making this advance, as I can testify from personal experience.

Postoperative glaucoma. The best prevention of this complication is a smooth intracapsular operation, for this condition is usually due to iritic or cap-

sular entanglements in the wound, also to cortex in the anterior chamber, and to epithelial ingrowth into the anterior chamber. If the tension persists, some operative method is necessary; preferably an iridectomy or iris-inclusion operation or trephining.

Glaucoma due to epithelial ingrowth is fatal to the eye. It may be caused by a delay in healing due to the presence of iris, capsule, or cortex in the wound or to the carrying into the eye of epithelial cells on the knife or on other instruments introduced into the anterior chamber. The prevention of this condition is obvious. Leave no foreign substance in the wound and have point and edge of knife sharp and free from any roughness.

There are occasional cases of post-operative glaucoma, usually following needling, which may recover without operation.

Late iris and vitreous prolapse is usually due to some accident. A well-placed protective bandage is the best preventive of this condition, using the Ring mask also.

On December 18, 1934, I performed an intracapsular extraction without complication on a man 68 years of age; one central conjunctival suture, no iridectomy. Three days later a sudden cough caused him to have pain in the eye. Examination showed lateral prolapse of the iris, which was removed. As long as the central suture held there was no prolapse above. However, a few days later this gave way, and there was marked bulging and prolapse of the iris above. This caused slow convalescence and will require future surgery. A firm pressure bandage might have prevented this complication.

Retinal detachment following cataract extraction is for the most part incurable. It is not necessarily a part of the operation but is caused by anterior choroiditis of tubercular or focal-infection origin.

If an aphakic eye in which visual results have been good suddenly begins to become filled with vitreous opacities, treatment should be directed to whatever area of infection may be found. If none are discernible, then treatment

with tuberculin is advisable. Fifty per cent of all uveal disease is tubercular (Michael⁹).

The following is an illustrative case: The patient was 47 years of age. Two years after a cataract extraction with perfect results a retinal detachment occurred. This patient had been subjected to a most thorough physical examination. After a Walker diathermy operation, attachment was secured which held for three months and then recurred. The second eye was operated on for cataract with perfect results. Two months following the extraction, the vitreous in this eye became cloudy with exudate so that vision was reduced to 20/200. Metamorphopsia was also present. Under tuberculin treatment vision returned to 6/5 with a clearing of the vitreous and disappearance of the distortion. In this case also there was a slight focal reaction several times following the injections. In such instances I believe treatment with tuberculin to be justified even though the skin test may be negative, as it was in this case.

Irritation from retained cortex can be prevented only by the latter's complete removal. If in any case cortex is present and does not become absorbed the alternate use of atrophine and eserine will help. The surgeon may even be justified in the removal of cortex and capsule in a secondary operation; if necessary, under a general anesthetic. I have had no personal experience in the use of lens protein but much experience in other foreign proteins which apparently have their use in such cases.

Age is, perhaps, the greatest factor in the nonabsorption of retained cortex; the older the patient the more the eye will be irritated by cortex. It is a common experience that lens cortex is well tolerated in the young.

Sympathetic ophthalmia. This is fortunately a very rare complication. I once thought I had such a case until the pathologist reported that the enucleated eye did not show the characteristic epithelioid cells. Clinically, it was a case of sympathetic ophthalmia and the final result in the sympathizing eye was only enough vision to let the patient get about. One other case which did

show the cellular changes followed the same course and left the patient with 20/200 vision in the sympathizing eye.

There are two rare but important postoperative complications which have received little attention in the literature: One is **corneal opacity**; not striated keratitis, but a permanent, dense, central corneal opacity. I have had four such cases. I know of no treatment for this condition, but if it occurred in one eye I should use an undivided conjunctival flap in operating upon the second eye, preferably the Czermak subconjunctival method, which involves only a lateral slit in the conjunctiva. This might help in maintaining the corneal nutrition.

The other complication is a **fistula**. This should be dealt with early by placing a conjunctival flap over the fistula after cauterizing the fistula and under surface of the flap with nitrate of silver.

Observations and conclusions: The cataract surgeon should know his patient as well as possible. Therefore, a proper preoperative general physical examination is most important and should not be slighted. The examination of both eyes should disclose especially the pupillary reactions and intraocular tension.

If one is an infrequent operator or is operating in a strange environment, he may follow the procedure on paper first; that is, make a careful list of his requirements and the various drugs and instruments which he will use, and go over this in advance with the operating-room assistants.

Reserve the intracapsular operation for immature lenses in people over 55 years of age. Perform capsulotomy in mature cataracts at whatever age. In people under 55 years of age, having immature lenses, perform capsulotomy, removing the cortex by pressure and anterior-chamber irrigation; what is then left is usually taken care of by absorption, without serious consequence.

Conjunctival sutures are an advantage, but not a sure preventive of complications, except that the upper lid cannot enter into the anterior chamber. This accident has occurred twice in my experience, but fortunately was discov-

ered early enough to prevent loss of the eye.

Now the tendency is toward a peripheral iridectomy or iridotomy. This does not always prevent prolapse of the iris, so that full iridectomy is still the safer procedure. The advantage of the round pupil is so great, however, that in many cases occurring in the middle years of life it can be preserved without prolapse if the wound is covered with a previously formed conjunctival sliding flap (the Van Lint flap).

The need now is the perfection of a method for the removal of retained capsule in older patients. Arnold Knapp expressed this lack in 1928,¹⁰ asking for better illumination. Hildreth¹¹ recommended the ultraviolet light. Nugent¹² wrote in favor of it, believing the need to have been met by the Hildreth light. I think the difficulty is not so much in seeing the capsule, except in certain cases, as in grasping it with any kind of forceps. May one hazard a prediction

that some technique will be found by which this troublesome capsule may be removed after the lens is extracted? It is only exceptionally that one can remove the capsule with forceps. This need has not been entirely met by the instrument of D. M. Yazujian as described in a recent issue of the *American Journal of Ophthalmology*.¹³ If the capsule is thickened, it may be removed by the capsule hook; but when dealing with the thin capsule use mild irrigation and mild suction.

Senile cataract is so common and so disabling to the patient and its removal so dramatic or so tragic, as the case may be, that we can not spend too much time nor thought on our failures as well as on our successes. May I again quote from Nicholas Senn: "Brilliant operators are not always the best surgeons. The best results in surgery follow the one who is most painstaking in the minutest detail."

References

- ¹ Gifford. Trans. Amer. Acad. Ophth. and Otol., 1920, p. 171.
- ² Lancaster. Trans. Sect. Ophth., Amer. Med. Assoc., 1927, p. 273.
- ³ Beard, C. Ophthalmic surgery, p. 5.
- ⁴ Lindner. Lectures at Northwestern Univ., 1935, April, p. 52.
- ⁵ Woodruff. Trans. Sec. Ophth., Amer. Med. Assoc., 1931.
- ⁶ Davis. Amer. Jour. Ophth., 1932, p. 208.
- ⁷ Thilliez. Soc. franç. d'Ophth., 1922, v. 35, p. 406.
- ⁸ Lindner. Lectures at Northwestern Univ., 1935, April, p. 53.
- ⁹ Michael. In Friedenwald's, Pathology of the eye. New York, The Macmillan Co. 1929, p. 70.
- ¹⁰ Knapp. Trans. Sect. Ophth., Amer. Med. Assoc., 1923, p. 221.
- ¹¹ Hildreth. Amer. Jour. Ophth., 1934, May, p. 414.
- ¹² Nugent. Amer. Jour. Ophth., 1934, Feb., p. 135.
- ¹³ Yazujian. Amer. Jour. Ophth., 1935, June, p. 556.

NOTES, CASES, INSTRUMENTS

REMOTE POINT FOR VISUAL-ACUITY TESTS

FRANK G. MURPHY, M.D.
MASON CITY, IOWA

As a test for visual acuity of distant objects we have accepted test types which subtend a visual angle of 5 minutes, the test usually being made at a distance of 20 feet. At this distance the emmetropic eye must exercise some degree of accommodation and convergence. To the extent that this physiological function is exercised in the normal eye for clear vision at 20 feet, the hypermetropic eye, when corrected for this distance, is in an equal degree myopic with the same tendency towards exophoria that is common in most eyes when the image tends to form in the vitreous. The exophoria encouraged by a minor degree of myopia thus artificially induced may scarcely be realized at short distances beyond 20 feet, but its effect increases in direct proportion to the square of the distance.

Every student of physiological optics is familiar with these refractive phenomena although in practice we usually proceed as though they did not exist. Because it is the common practice of the eye physician to prescribe glasses on the assumption that light rays emanating from an object at a distance of six meters are sufficiently parallel for normal vision at all distances, many persons are made to suffer from induced asthenopia, especially those whose vocations require visual concentration upon objects a block or two or a mile or more away. Automobile drivers comprise the greatest number who suffer from this error, although locomotive engineers, sailors, and airplane pilots are among others who require comfortable long-distance vision. Consequently many hypermetropic persons who have acquired compensation in a comfortable degree but who are in search of better vision begin to experience binocular asthenopia when wearing glasses prescribed according to the

accepted method of testing visual acuity at a distance of 20 feet.

Until the beginning of the twentieth century and before the American people began to live to a great extent in automobiles, the arbitrarily established standard of 20 feet for the estimation of distant vision was satisfactory enough for most persons. In those days probably 90 percent of the visual work of the average individual was accomplished within a radius of 20 feet. Even motion pictures, which require considerable visual concentration, are more than this distance away. It is not so much the correction of the manifest hypermetropia at six meters, with its scarcely noticeable myopic effect for greater distances, that gives rise to complaint after attendance upon the theater, as the eyestrain that has been induced by an uncompensated exophoria. The slight myopic effect is noticed by the automobile driver at night, when far-away lights appear diffused and a closer-than-normal approach to objects must be made before they are clearly discerned.

In clear daylight, after long hours of travel, the slight dimness of objects in the distance is not so much complained about as the mental tiredness that is experienced. The customary manner of correcting the refractive errors of the hypermetropic patient may have more far-reaching effects than we at first might suspect. It causes visual effort and mental concentration to become more difficult when long continued, and herein lies the refractionist's opportunity to assist in reducing the number of casualties in automobiles that may occur because of a possible diminished alertness of the driver. Much time is often consumed in attempts to reduce the ill effects of exophoric asthenopia, which, no doubt, is often an induced eyestrain caused by blindly following an arbitrarily established standard that was more useful in the days of its inception than at the present time.

The outline of an object about seven

feet in diameter a mile away will subtend a visual angle of 5 minutes. When one-half-diopter sphere is deducted from a six-meter correction for hypermetropia the object appears to recede to a distance approximating infinity and a clearer conception of shades and colors has been attained. When examinations are made at a distance of three or at four-and-one-half meters, spheres of even greater refractive power must be deducted or added in hypermetropic or myopic corrections to afford visual acuity for much greater distances. When esophoria exists to a marked degree and such perfect distant vision is required that even lights seen at a great distance at night will not appear in the least diffused, it may be necessary to humor the vigorous internal recti by adding low-degree prisms, base out.

The present standard of measuring the refractive errors of the hypermetropic eye is sufficiently satisfactory for a considerable percentage of our population, such as housewives, salesclerks, factory workers, and others who live in congested centers of population. But for the automobile traveler, the truck driver, the farmer, the railway trainman, and all who require comfortable and acute distant vision, our accepted standard is apparently inadequate. If our offices are not so situated that a distance of at least a few blocks may be seen by the patient, much of our painstaking efforts may not be so productive of satisfactory results as they might otherwise be. A properly situated office suitable for making these distance tests should, in the opinion of the writer, be regarded as part of the necessary equipment of the ophthalmic physician.

5. South Federal Avenue.

A COMBINATION LOUPE AND HEAD MIRROR*

CONRAD BERENS, M.D.

NEW YORK

Because it has been found troublesome to remove the loupe attached to my spectacles in order to use a head mirror a combination loupe and head mirror was devised.†

The description of the loupe attached to the spectacle frame, both with and without a light, has been previously published.¹ The addition of the concave head mirror, 55 mm. in diameter with an aperture 6 mm. in diameter, seems to be practical not only for physicians

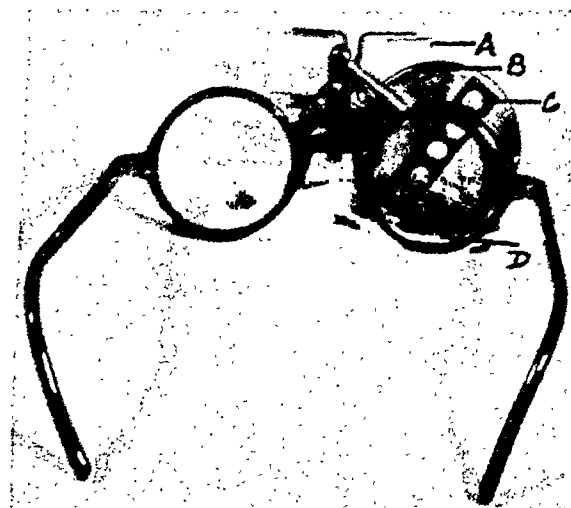


Fig. 1 (Berens). Head mirror with loupe and attachments for spectacle frame. A, modified Beebe loupe. B, head mirror. C, bar for insertion of plus lenses. D, bifocal segment.

treating diseases of the ear, nose, and throat, but it is useful also for the ophthalmologist who wishes to free both hands when examining and treating his patients. A sliding bar with an aperture and four cells to hold lenses adds to the value of the mirror for the presbyopic surgeon. The preferred lenses are +1.00, +2.00, +3.00, and +4.00.

35 East Seventieth Street.

* Presented before the American Academy of Ophthalmology and Otolaryngology, September 17, 1935, Cincinnati, Ohio.

† Made by the E. B. Meyrowitz Company, New York, New York.

¹ Berens, C., and Losey, R. R. A new arrangement of the Beebe loupe. Trans. Sect. Ophth., Amer. Med. Assoc., 1928, p. 417.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology
March 1935

Dr. J. Milton Griscom, chairman

Voluntary control of accommodation

Dr. William Zentmayer presented two cases of this condition, a report of which has been published in this Journal (December, 1935).

Voluntary control of accommodation for distance

Dr. Warren S. Reese said that his patient's condition corresponded to that of Dr. Zentmayer's patients. On looking into the distance without glasses, the patient read 6/60 with each eye. If told to read distinctly, he was able to read 6/6 without squeezing the lids or changing his eyes, except that the right eye turned in and the pupils contracted. He was hyperopic 5.50 D. and wore the full correction. He was of a neurotic type, this evidently being dependent upon a gastric ulcer. The condition was of interest in that it illustrated the profound effect of accommodation on convergence. With his glasses on he was practically orthophoric. He had worn glasses since childhood and dated practically all of his symptoms from the time the gastric ulcer had appeared, one year ago.

Discussion. Dr. Alfred Cowan thought the increased accommodation was the result of convergence, not that the convergence was the result of accommodative effort. On examination of Dr. Zentmayer's patient he found a total accommodation of 10 diopters, while at 6 meters the greatest effort disclosed only .5 diopters; and this could be obtained only while he converged. Dr. Reese's case was of the same type. He examined Dr. Zentmayer's patient with the slitlamp and, in order to eliminate movement during convergence, he had the patient sight along a string which was stretched from the eye to a

distance of 6 meters. One eye was sighted directly along this string while the other converged. The increase in curvature of the anterior surface of the lens seemed to be uniform all over. There could be seen no irregularity, such as a bulge in the central portion of the lens and relative flattening around the periphery.

Dr. H. Maxwell Langdon said that one of the most interesting features of this case was the control which the man had of each eye separately. Ordinarily when a person converged he turned each eye an equal amount from the primary position towards the other but this man could keep one eye directed straight ahead and do all the converging with the fellow eye.

Low-viscosity nitrocellulose used as an embedding medium for eyes

Dr. W. E. Fry said that Ruby had reported in 1933, that there were nitrocellulose products available, suitable for embedding masses. Wilson described the viscosity of commercial pyroxyline as ranging from one-half to 200 seconds, measured by the falling-ball test. In 1934, Davenport and Swank reported on the use of low-viscosity nitrocellulose for embedding, and noted that the alcohol, ether, and nitrocellulose solution would tolerate water up to 6 percent, thus permitting the use of 95-percent alcohol instead of absolute alcohol. Recently the same type of nitrocellulose had been used in embedding eyes, in the University of Pennsylvania laboratories, and sections of a whole eye had been obtained at 8 microns, and sections of the posterior half of an eye at 4 microns.

Shoemaker's modification of the Motais operation for bilateral congenital ptosis of the lids

Dr. Hunter W. Scarlett said that the Shoemaker modification of the Motais operation for ptosis of the lid consists in isolating, but not detaching any por-

tion of, the superior-rectus muscle, putting a double-armed suture through the tendon, and bringing the latter up to and attaching it to the superior border of the tarsus. The superior border of the tarsus is exposed by making a through-and-through incision in the lid, at a level of the upper border. After the tendon is sutured to the tarsus, the suture is brought out on the skin surface of the lid about 4 or 5 mm. above the ciliary border and tied around a small piece of rubber tubing.

A further report upon intracapsular cataract extraction by the Knapp method, as compared with the classical procedure

Dr. Leighton F. Appleman said that he had reported a series of 300 consecutive cases, in which 175 were operated on personally by himself, 100 by the intracapsular method of Knapp, and 75 by the classical method of expression; also 125 operated upon by assistants under his direction, 26 by the intracapsular method, and 99 by the classical method of expression.

After an analysis of the visual results, it was found that in 77 out of 100 intracapsular cases, and in 15 of the assistants' intracapsular cases out of 26 successfully done, or in a total of 92 out of 126 done, vision of 6/12 or better was obtained, a percentage of 73.01.

Of those done by classical expression, 48 personal cases out of 75 and 63 of the assistants' cases out of 99, or a total of 111 cases out of 174, resulted in 6/12 vision, or better, a percentage of 65.79.

Considering his own series alone, in the 100 intracapsular cases, vision of 6/12 or better was obtained in 77 percent; while of the 75 done by the older method 6/12 vision or better was obtained in 64 percent, a difference of 15 percent in favor of the intracapsular method.

He concluded that the intracapsular operation gave a remarkably smooth and rapid recovery, with scarcely any reaction; the patient required but one operation; the stay in the hospital was shorter, and the visual results better. He believed it to be superior to the older type of operation and therefore recommended its general use.

Discussion. Dr. George B. Cross (Chester, Pennsylvania) reported that he had been using the Hess forceps and making a small buttonhole iridectomy. Also it had been his practice to obtain a good-sized conjunctival flap, which made sutures unnecessary, especially if the flap was held down with a spatula for a short time just before the eye was closed. The natural tendency of the flap was to stick.

Dr. Appleman said that he had made no distinction as to the type of cataract upon which he tried the intracapsular extraction. Those that were immature, he was, at times, unable to grasp, due to the fact that the lens was in the stage of swelling, and in such cases he removed the lens by expression after capsulotomy.

Iridectomy had been performed previously to extraction in this series. He had tried to do simple intracapsular extraction without iridectomy only to find, at the first dressing, that the iris had bulged forward and caught in the wound. Retrobulbar injection he had used only once, the O'Brien facial block being usually employed. He preferred a small conjunctival flap, if possible, as the bleeding was less troublesome and a large flap became mutilated while the iridectomy was performed. Healing was just as smooth and uneventful without the flap.

Mucous-membrane graft for symblepharon; pedicle-flap blepharoplasty

Dr. Edmund B. Spaeth showed moving pictures of operations.

Discussion. Dr. George H. Cross liked silver conformers best, probably because he made them himself and could modify them to suit the individual case. He had just finished a new type of conformer without any hole in it and lined with a 1-mm. layer of lead. This was to be inserted between the eyelids and eyeball to protect the eye while X-ray therapy was being applied to new growths on the eyelids.

He said that Dr. deSchweinitz would remember that when he was in charge of the eye work in the Army during the World War, he saw many successful grafts that were punctured full of holes to allow serum and blood that had col-

lected beneath it to ooze through and prevent separation of the graft from its bed. The important factor in a successful graft was proper pressure. This was obtained by covering the eye with warm Kerr's modeling compound and applying a tight roller bandage.

Dr. Spaeth stated that in his opinion no matter how thin an epidermal graft was it was never wholly satisfactory, for the patient had a resultant chronic low-grade conjunctivitis and this was not present with the mucous-membrane graft. Naturally, this matter was of importance only in the presence of a normal eyeball.

A. G. Fewell,
Clerk.

CHICAGO OPHTHALMOLOGICAL SOCIETY

April 15, 1935

Dr. E. V. L. Brown, president

Nevus flammeus and megalocornea without glaucoma

Dr. Roy O. Riser said that this 9-year-old girl was brought to the Children's Memorial Hospital on March 18, 1935, with vision in each eye of 20/100, not improved by correction of the hyperopia. She also had a muscular instability, nystagmus, convergence, and divergence, occurring in rapid succession. The divergence was alternating and about 35 degrees. The right eye appeared normal in every way.

There was a large nevus flammeus on the left side of the face and palate, and X rays showed calcification in the left occipital lobe. There was a large polypoid nevus protruding from the left nostril. The left eye was large and the cornea clear, measuring 14 mm. There was a normal disc, with large tortuous retinal vessels. Tension was normal and the anterior chamber deep.

Discussion. Dr. Elias Selinger did not think that this could be classed as a case of nevus flammeus with megaloglobus and without glaucoma, because the large eyeball was evidence of glaucoma either past or present, and excavation of the nerve head was not necessarily part of juvenile glaucoma.

Dr. Richard Gamble thought that Dr. Selinger's point was interesting. The enlargement of the eyeball might be due to glaucoma, although in this case there was no other evidence of it. On the other hand, the eyeball might enlarge simply because it had an unusually great blood supply. In many of these cases all the structures of the face were larger on the side of the nevus.

The cause of glaucoma of this type might be due to the fact that the nevus extended forward into the root of the iris and blocked the filtration angle; it might be due to blocking of the vortex veins by a diffuse nevus of the choroid; it might be due to obstruction in the region of the cavernous sinus, and, finally, it might be due to the plasmoid character of the aqueous.

Before deciding to operate on such patients it was well to consider the possibility of a catastrophe, as a number of cases had been reported in the literature in which a severe hemorrhage occurred, so that enucleation had to be done. Even then, in several cases, the carotid had to be ligated. Inasmuch as these cases were usually unilateral, and the affected eye was, as a rule, nearly blind, it might be well to defer operation until the eye became either markedly enlarged or painful. The child presented had fairly good vision in the affected eye, and if other signs of glaucoma appeared, an operation was indicated, preferably a trephining.

Dr. M. L. Folk said that he had operated in two cases of nevus flammeus and glaucoma which turned out satisfactorily. The question here was whether in this case there was glaucoma or not. The eye was large with a deep anterior chamber, which spoke for glaucoma. On the other hand, there was no excavation of the disc. It might be advisable to take the tension under anesthesia as tactile tension could not be depended upon.

Hereditary anterior megalophthalmos

Dr. Roy O. Riser said that this boy, 10 years of age, was first seen at the Children's Memorial Hospital on February 21, 1934, with normal vision in each eye. Each cornea was clear and

measured 13.5 mm. Both anterior chambers were deep. The irides were tremulous, particularly at the periphery. There were no complaints. The tension and discs were normal, and there was an absence of all signs of glaucoma. The fingers and toes were normal.

A second case was that of a 3-year-old boy first seen at the Children's Memorial Hospital on June 26, 1933, with unusually large corneae, each measuring 13 mm. in diameter. This measure had now increased to 14 mm.

At that time there was an alternating divergent strabismus of 30 degrees. Tactile tension was normal. The corneae were clear and the anterior chambers normal. There was a tremulous iris in each eye. With -10 diopter lenses the eyes were almost parallel at times, while at other times the right eye would wander out 40 to 50 degrees. There was an absence of crypt markings in the irides. The discs were normal, and atropine cycloplegia did not cause rise in tension.

The family history was negative. The boy had long, thin fingers and toes, and wore shoes two-and-a-half sizes larger than normal for his age. He had a moderately expressionless face, these signs being classified under arachnodactylia or Marfan's syndrome, which was probably best associated with hereditary anterior megalophthalmos on a calcium-deficiency basis.

Ocular tuberculosis treated with tuberculin

Dr. Chester Lockwood said that the first patient, a woman 23 years of age, had first been seen in the eye clinic on December 27, 1934, with complaint of poor vision in the right eye of about two weeks' duration. The conjunctivae, corneae, and pupils were normal. The left disc and fundus were normal. In the right eye an area of acute chorioretinitis was seen below the disc, yellowish-white in color, with poorly defined borders, the area more or less gradually merging with the rest of the fundus. There was another similar area in the region of the macula. The disc outlines were somewhat blurred and the whole fundus was hazy and was

seen with difficulty through the very cloudy vitreous. There were some precipitates on the posterior surface of the cornea. This patient had been sent to Cook County Hospital, where she remained until January 5, 1935. Typhoid vaccine was administered during this time. X rays of the chest and head were reported as negative; tuberculin skin tests were reported four plus for all four dilutions; the blood Wassermann test was negative. The patient had reported again to the clinic and had been started on tuberculin treatment, the initial dose of 1/10,000 mgm. of old tuberculin having been increased by 1/10,000 mgm. every second to fourth day.

At present the vision was O.D. 20/20 — 4, O.S. 20/20 + 4. There were many large vitreous floaters which still made the fundus appear slightly hazy. The areas of acute chorioiditis and retinitis were improving in that there was less haziness and the areas were lighter in color and were more distinctly outlined from the surrounding fundus.

The second patient, a woman 25 years of age, had come to the clinic on July 21, 1934. The vision in the left eye had begun to fail one year ago when she had had pains in the left eye and left side of the face. When she was 5 years old she had had abscessed glands in the neck following scarlet fever. The vision was, O.D. 20/13, O.S. 20/50. The left fundus was diffusely involved in a chorioretinitis, mostly on the temporal side. The Wassermann test was negative. On August 1st, she was given old-tuberculin skin tests which showed a two-plus reaction. This patient also had tonsil tags, remaining from a previous operation, which had been treated by electro-coagulation. X ray of the chest showed no evidence of tuberculosis of the lungs.

This patient was started on old tuberculin treatment, 1/10,000 mgm. and given gradually increasing doses every two to four days, depending on whether or not she developed any reaction from the preceding dose. At the present time vision was O.D. 20/15, O.S. 20/40. In both eyes the corneae were clear, the

pupils reacted to light and were clear, there were no deposits on the back of the cornea, and tactile tension was normal. In the left eye, the disc outlines were fairly well defined. Throughout the fundus were many small and large irregularly shaped whitish areas with more or less well-defined borders, both the inside and the borders of the areas showing black pigmented spots. This was especially pronounced in the left macular area.

He said that several patients had been treated in this manner at the eye clinic during the past few years with no untoward results, so far as was known. The treatment had been used in case of scleritis, keratitis, uveitis, and choroiditis, when a positive skin reaction had followed injections of old tuberculin. In these two cases the first patient showed a marked improvement not only in vision, but also in the appearance of the fundus; in the second, the disease was apparently arrested.

Not long ago syphilis was generally blamed for many of these eye lesions, but lately one heard more and more that tuberculosis was the cause. Was one warranted in making a diagnosis of tuberculosis in cases that showed a positive reaction to injections of old tuberculin? Was one warranted in confirming such diagnosis when the eye condition improved under tuberculin treatment? Was the good result in these cases the result of a specific reaction to tuberculin, or the result of the foreign protein contained therein?

Essential progressive atrophy of the iris, with glaucoma

Dr. E. K. Findlay said that this woman, 35 years of age, was first seen in April, 1932. Fields of vision and tension were normal. A low degree of hyperopia was present. The right pupil was normal, the left pupil was oval in shape and contracted readily from above down and slowly from side to side. Two months later, in the left eye, a dark area had been noted at the inner side of the iris and at the same time the tension of the eye had increased to 38 mm. This tension had been controlled by pilocarpine, but two atrophic

areas in the iris were well defined. Myopia had developed but with correction there was normal vision and very little contraction of the field.

In October, 1934, the tension had increased to 50 mm. Vision was reduced, the cornea steamy, and there was some pain. A sclero-corneal trephining had been done with uneventful healing. Since that time the tension had remained between 13 and 15 mm. The disc was cupped and the corrected vision 20/120. There had been a steady increase in the atrophic area.

Discussion. Dr. Sanford Gifford offered a theory as to why these patients developed increased tension when the iris became atrophic. It might be explained by the fact that the iris held the pectinate ligament open when the pupil was in tone. When a hole developed, the iris relaxed and the space closed. If one cut the pectinate ligament it would remain open, but if one cut the iris, the iris simply relaxed and the ligament was released, closing Fontana's spaces.

Minute structure of the retina in primates

Dr. S. Poljak said that the material for study had come from the retina of the monkey and ape; fresh human material had not been available. The method of staining was that of Golgi's. The most important result of this study was the finding of three or four distinct varieties of bipolar cells (named d-, e-, f-, and h-variety) scattered all over the retina and mingling indiscriminately with one another. These three or four bipolar varieties were equally present also in the macula and fovea. The d-, e-, and f-varieties were diffuse, each being related to a group of rods and cones (polysynaptic bipolars); also their territories reciprocally overlapped. The h-variety was monosynaptic or individual, each bipolar cell being related to a single cone (cone- or midget-bipolar). The above arrangement was characteristic not only of the peripheral regions, but of the macula including the central fovea as well. There were six varieties of ganglion cells, also present in all re-

gions of the retina; five were of a diffuse, polysynaptic character, each being related to a smaller or greater number of bipolar cells; the sixth variety, or the midget-ganglions, exceptionally numerous in the macula, were monosynaptic; that is, each ganglion was related to the telodendron of a single cone-bipolar, although it might simultaneously be related to other bipolar varieties.

This study demonstrated in the primate retina several sets of neurons, present side by side and intimately interwoven into one another; the most delicate one was composed of monosynaptic neurons: the cones, the cone-bipolars and the small or midget-ganglions. This set was probably instrumental in fine space perception; another set was somewhat rougher and was composed of the rods and cones of all bipolar cells including the diffuse varieties, and of all six varieties of the ganglion cells.

Discussion. Dr. J. E. Lebensohn asked if Dr. Poljak had found any suggestion in his studies of the finer structure of the retina to indicate a difference between the cells subserving the visual function and those connected with the photo-motor response. Reports had been made by authoritative observers of cases in which the eye was insensible to visual stimuli but still reacted to light. The optic nerve had, two types of fibers, small and large, which possibly had different functions. Was there anything in the retinal structure to explain these phenomena?

Dr. Poljak said that of course there were all kinds of fibers from fine to quite coarse; those from the macula were in general thinner than those from the retinal periphery. He admitted that it was impossible at present to answer Dr. Lebensohn's question, although there were certain ganglion cells that could, perhaps, be considered as reflex cells. Hess claimed that it was only the fovea and its immediate proximity which elicited the pupillary reflex. If that were so, one would think the central region of the retina would contain

some special cells, absent in the rest of the retina. But such cells limited to the macula alone were not found. Nevertheless, one must think of this possibility. A recent paper by Gasteiger stated that the pupillary reflex could be obtained from any part of the retina. The Hess hypothesis was therefore not valid, and one wondered, if the reflex cells were scattered all over the retina, how they could be distinguished morphologically from other ganglion cells. To solve this it would be necessary to examine in suitable cases eyes in which the pupillary reflex was absent, and try to determine whether a particular ganglion variety were also present. As yet it is impossible to answer the question.

Robert von der Heydt.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

March 19, 1935

Dr. James J. Regan presiding

A new needle holder

Dr. Frederick H. Verhoeff demonstrated his instrument.

A new type of perimeter

Dr. Charles Walker demonstrated the perimeter which is for use in a dark room. Lights are used instead of paper test objects. The lights run on tracks spaced every 30 degrees along the surface of the hemisphere. Glass filters and various-sized apertures are easily placed before the lights. A new device for fixation has been worked out on this instrument. Further reports on the work will be published by Dr. Walker at a later date.

Does diabetes contribute to cataract formation?

Dr. J. Herbert Waite read a paper on this subject which was published in the New England Journal of Medicine, March 14, 1935.

Trygve Gundersen,
Recorder.

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis

WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver

EDWARD JACKSON, Consulting Editor
Republic Building, Denver

HANS BARKAN
Stanford University Hospital, San Francisco

HARRY S. GRADLE
58 East Washington Street, Chicago

EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis

PARK LEWIS
454 Franklin Street, Buffalo

C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City

M. URIBE TRONCOSO
350 West 85th Street, New York

JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York

Address original papers, other scientific communications including correspondence, also books for review, and reports of society proceedings to Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.

Exchange copies of medical journals should be sent to Dr. William H. Crisp, 530 Metropolitan Building, Denver.

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis. Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Authors' proofs should be corrected and returned within forty-eight hours to the manuscript editor. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

CONTEMPORARY CRITICS OF GRAEFE

Very many, perhaps even a majority, of the important discoveries in general science have been subjected to criticism and controversy; and the same is true of the science and art of medicine.

It was decades before Jacques Daviel's operation for the extraction of senile cataract attained universal acceptance. Today we see history repeating itself as the old battle between couching and linear extraction is paralleled by that between the extracapsular and the intracapsular technique for removal of the cataractous lens.

Albrecht Graefe, dead at forty-two years from tuberculosis, after a short but exceedingly brilliant professional career, has been so internationally admired and revered as a pioneer in modern ophthalmology that it may come to some as a shock to realize that his use of iridectomy for acute glaucoma was rather vigorously condemned by eye surgeons of great eminence, men

who are given high praise whenever the history of ophthalmology in the second half of the nineteenth century is under discussion.

Graefe's first account of his use of iridectomy in the treatment of glaucoma was published in the "Archiv für Ophthalmologie" (of which he was founder, editor, and principal author) volume three, part two, 1857, under the title "Concerning iridectomy in glaucoma and concerning the glaucomatous process." A year earlier he had described the use of iridectomy in chronic iritis and iridochoroiditis; and it is an interesting fact that he also employed the operation in sympathetic ophthalmia.

The Medical Times and Gazette, of London, England, was for many years one of the outstanding examples of medical journalism of the nineteenth century. The volume of that journal for 1858 contains eight original papers dealing with iridectomy. The first, appearing in the issue for March 27th, was by J. W. Hulke, Assistant Surgeon

to King's College Hospital. In January, 1858, this same writer had read before the Royal Medical and Chirurgical Society a paper entitled "On some points in the pathology and morbid anatomy of glaucoma," which was discussed by Mr. Bowman and Mr. Critchett.

Hulke's essay in the *Medical Times and Gazette* speaks of mercury and the abstraction of blood as being the chief measures heretofore employed against this intractable and hopeless disease. Incidentally, reference is made to a fact which to the ophthalmologist of today sounds strangely; namely, that Graefe at first tried atropine in the treatment of acute glaucoma. Up to that time, the local operative treatment of the disease had been practically limited to paracentesis of the anterior chamber, the results of which were of course quite temporary.

Graefe commonly made his iridectomy at the inner side of the cornea, although he thought it might be made above for appearance's sake.

The use of iridectomy for glaucoma was, according to Hulke, introduced into England by Mr. Bowman, being first performed by him at Moorfields Hospital on May 1, 1857. It was subsequently taken up by Critchett and other members of the Moorfields Hospital staff. When Hulke wrote his essay for the *Medical Times and Gazette*, the operation had been subjected to extensive trial for six months and had "succeeded beyond expectation." Bowman preferred incision above, because of the cover furnished by the upper lid. Critchett modified Graefe's operation by making a small incision within the margin of the cornea, drawing out a portion of the iris with a flat hook, and leaving it in the wound.

In its main features, Graefe's operation for acute glaucoma received enthusiastic approval from Bowman, Critchett, Hulke, and other workers at Moorfields. But there were two British writers of light and learning who did not hesitate to question, not only the efficacy of the operation, but Graefe's ability as an ophthalmologist. The *Medical Times and Gazette* for April 3, 1858, presented a paper by T. Wharton Jones, Professor of Ophthal-

mic Medicine and Surgery in University College, London, and William Mackenzie, Surgeon-Oculist to Queen Victoria and Lecturer on the eye in the University of Glasgow, in which surprise was expressed at the operation's "having been so eagerly imported into this country." Jones and Mackenzie condemned Graefe's practice of iridectomy as "opposed to the plainest principles of surgery and common sense," and they had no doubt that in a short time iridectomy as a means of treating glaucoma would be abandoned in favor of "the practice . . . of more frequently puncturing the cornea and sclerotica in this disease."

In fairness to Jones and Mackenzie, it must be mentioned that their condemnation of iridectomy for glaucoma was associated with criticism of its use for a variety of purposes, in some of which the operation has not so successfully withstood the onslaughts of time. They admitted the propriety of iridectomy in exclusion of the pupil.

The wholesale condemnation of Graefe by Jones and Mackenzie brought forth a number of controversial communications to the *Medical Times and Gazette*. In the issue for April 10, 1858, Thomas Windsor, Senior Assistant-Surgeon to the Manchester Eye Hospital, who had for some time been engaged on a translation of Graefe's own papers, took exception to some of the statements of Jones and Mackenzie as inconsistent with opinions previously expressed by Mackenzie in his well-known treatise on diseases of the eye. Two weeks later, writing from Berlin, where he had witnessed Graefe's operations and after treatment, James G. Hildige of Dublin pointed to like contradictions between the Jones and Mackenzie paper and Jones's statements in his "Principles and practice of ophthalmic medicine and surgery." "This," says Hildige, "is somewhat inconsistent with the high attainments and professional repute borne by this gentleman, and scarcely comes up to our English ideas of straightforward dealing. I have only to add that Professor von Graefe continues to perform his operation with success on patients who come to him

from all parts of Europe, and where every other treatment has failed."

In the issue of the *Medical Times and Gazette* for May 1, 1858, Graefe took up the cudgels in his own defense. He had been "doubtful whether the articles merited an answer or not, for the esteemed authors confess that they are without any personal experience on the questionable point," but he undertook a reply "as a tribute . . . to their earlier merits." After dealing with miscellaneous criticisms concerning the use of iridectomy and other inflammatory conditions, he passes "to the point which is most important to me, viz., iridectomy in glaucoma." The inadequacy, he points out, of paracentesis for glaucoma was clearly demonstrated for years in his own large practice. On the other hand, patients who under medical treatment aided by paracentesis had become completely blind in one eye were permanently cured by iridectomy on the second eye. He regrets that Mackenzie should regard as opposed to common sense a procedure which has been welcomed warmly by many leaders in ophthalmology.

The general tone of Graefe's reply was justifiably, although gently, sarcastic. In his conclusion he says: "I willingly pardon older, and so highly deserving men, for their want of that elasticity requisite for the immediate reception of new views; . . . but I should indeed have expected more moderation from the Nestor of English ophthalmology."

The lesson is obvious. None of us should be so tenacious of settled habit and conviction as to close the door to new methods or new opinions, no matter how far they may at first seem to depart from what we have regarded as true and wise. The innovation of today may become the settled practice of tomorrow, and a new vision may make "ancient good uncouth."

W. H. Crisp.

TRACHOMA

A General Assembly of the International Association for Prevention of Blindness and The International Organization Against Trachoma was held

in Paris, in May, 1934. The proceedings of this Assembly have now been published. Professor de Grosz, chairman of the organization against trachoma, briefly reviewed the progress in the fight made against trachoma in Egypt that was started by MacCallan in 1903. There are now in Egypt 64 ophthalmological hospitals or sections, and 32 school dispensaries; and in 1932 these institutions had 714,551 new patients.

The Health Committee of the League of Nations has compiled statistics of the prevalence of trachoma. In Lithuania, 34 percent of the inhabitants suffer from trachoma. In Japan, 700,000 cases were found, among ten million people examined. For Poland, the estimate was 400,000, and for Russia, 1,000,000 cases. Yet it is certain that under treatment the severity of the disease becomes attenuated; and the number of cases of incurable blindness has decreased.

MacCallan, reporting on conditions in the British Empire, states: "No universal scheme of prophylaxis for all countries can be recommended. Each country may require a different method." But "one method that should be applied to all countries is treatment in the schools." Segregation in trachoma schools has almost freed the schools of London from the disease. The epidemic in Amsterdam was wiped out. During the World War, trachoma was common among the labor companies brought from China, India, and Africa. But, by segregation and treatment of those affected, they were sent home better than when they came, and there was no extension of the disease among the armies in France.

In Egypt, trachoma appears as a sequel to the acute ophthalmias, caused by the gonococcus and the Koch-Weeks bacillus. But the proportion of the blind has decreased from 15.6 percent, in 1909, to 6.9 percent, in 1932. In southern Italy trachoma is a very serious matter. Of recruits rejected for the army in Sardinia, 63.5 percent were rejected for trachoma. Tunis, Algeria, and Syria are also greatly afflicted with trachoma. In the United States trachoma is almost confined to a belt, ex-

tending from the southern Allegheny Mountains to Kansas and Oklahoma, and to the Indian tribes. The negroes seem quite immune to trachoma. It is also common among the Indians of western Canada. Trachoma is a very serious cause of blindness in China, Indo-China, and the Dutch East Indies. In Java, the trachoma index is 5 percent among the Europeans, and 16.5 percent among natives. Racial immunity, or tendency to it, must be considered, but habits of living are very important.

The efforts to prevent trachoma have been greatly handicapped by ignorance as to its specific cause. In spite of our knowing that it is spread by contagion, the particular germ or virus causing it has remained uncertain. The observations recently reported in this Journal (1935, v. 18, p. 811) seem to throw important light upon the subject. But smallpox was eradicated by vaccination before there was the knowledge or the discovery of a germ for it, or of the nature of its specific virus. We know about trachoma that under regular, effective treatment it ceases to be contagious; and that by segregation and treatment, its spread can be controlled. Its tendency to cause blindness, either by corneal involvement or by distortion of the lids and consequent injury to the cornea, makes persistent treatment of it by well-known local remedies very important; and not only for the prevention of blindness, but for the comfort of the patient as well.

Edward Jackson.

EVALUATION OF CLINICAL AND LABORATORY FINDINGS

The correct evaluation of a method of treatment is often exceedingly difficult, even when both clinical and laboratory tests can be made. If the evidence derived from these two methods is in agreement, the case is apt to be proved, although both are open to errors. In those cases, however, in which clinical and laboratory findings suggest opposite conclusions, the physician is left in doubt. Usually, the clini-

cian is the enthusiast; the laboratory worker the restrainer. As to the former, he can observe the action on the patient, and this is, after all, the point under consideration. But so many factors other than those in question can be influential in producing the effect in an individual subject, that it is not always possible to be certain that the therapy involved produced the result noted.

In the laboratory, known materials can be used and exact experiments performed. The test-tube outcome can be predicted and the laboratory possibilities of the new treatment can be determined. But man is no test tube, and in his enormously complicated mechanism are multitudinous unknown factors that may vitally modify the laboratory experiment.

It is best, therefore, to keep an open mind, to weigh most carefully laboratory evidence against clinical evidence, and if these differ to be slow in arriving at a conclusion.

In such a state is aniseikonia today. Thus far, no one who has used the new instrument for determining size-image differences and has prescribed the lenses indicated in the examination of many patients is known to have been unimpressed by the number of patients made comfortable by size-image corrections; and if ever there was a difficult group of patients with which to deal, this is it, for the unfortunates who compose it have been from pillar to post seeking without avail relief from the intolerable eyestrain of which they complain and which has usually incapacitated them for close work.

In the St. Louis eikonic clinic, which has been conducted for a year and four months, about sixty percent of those for whom eikonic corrections were ordered have been clinically helped—some of them amazingly. Every effort has been made to conduct the test critically and skeptically. The work has been done by an ophthalmologist whose only interest has been to determine, if possible clinically, whether there is real merit in this test. The importance of the psychic effect is never for one moment overlooked, and although every

effort has been made to eliminate this, its possible weight as a factor in the good results is so seriously considered that no clinical conclusion can yet be given.

On the other hand, though clinical evidence may seem very suggestive, laboratory tests indicate that the element of unequal size of retinal images in amounts found with the eikonometer cannot be of very great importance, since they are equalled or surpassed frequently in many of the activities of a routine day. An excellent article on this subject will appear in an early issue of the Journal. This and other theoretical papers previously published are so suggestive as to force the careful reconsideration of the cases clinically aided by eikonic lenses. It is difficult to explain as psychical many of the cases that we have seen personally, such as that of a thirty-year-old surgeon who said, when told that theoretically the help he was experiencing could not derive from his eikonic lenses, "Let me give my own evidence. I have tried the glasses out in every way for the past six months, and whereas I was about to give up surgery because of my ocular discomfort, I can now, when using the correct eikonic lens, carry on with perfect comfort."

This patient is only one of several who feel equally strongly and have been equally critical, but, obviously, this is not conclusive evidence. Other factors may be present that have influenced these persons favorably. Furthermore, some patients who apparently *should* be helped are not. The possibility that the correcting of aniseikonia may act favorably on heterophoria has been pointed out by more than one writer on the subject, and this factor must be considered.

More instruments will soon be in use. It is most important that clinical reports be published by those who have only a scientific interest in the matter, so that the truth can be determined as early as possible. This is the desire of the originators of the instrument. They have a strong belief that the subject is of great clinical importance. From the standpoint of the individual who is

helped, it is unimportant whether his improvement is of mental or optical origin, but it is of great importance to the physician, for these are very elaborate and expensive tests to be done solely for their psychic effect.

Lawrence T. Post.

BOOK NOTICES

Pacific Coast Oto-Ophthalmological Society, 1935. 180 pages, 2 plates, 15 illustrations in the text. Published by the Society, Dr. Frederick C. Cordes, Secretary.

This twenty-third annual meeting of the Society was held in Portland, Oregon. The Society, with its 351 members, its 41 Honorary and Associate members, the latter scattered from Vienna and London to Victoria and San Diego, is devoted to both ophthalmology and oto-laryngology. The subjects of particular interest to ophthalmologists were: Surgical correction of pure convergence insufficiency; Hyaline bodies (Drusen) of the optic nerve and retina; Tuberculosis of the uveal tract; Spheno-palatine ganglion neuralgia, Iris bombé, The Genesis of glaucoma; A clamp for holding lid sutures in cataract operations; Unusual bilateral retinal detachment; and moving pictures of the Safar operation for detachment of the retina.

At this meeting the Society inaugurated an Instruction Course, of which no account is given in the Transactions. But for the course a synopsis was furnished of each subject; and, generally, with references to the periodical literature and books bearing upon it. The subjects of interest to ophthalmologists were: Uses of the cross cylinder; Injuries of the eye and their treatment; Practical application of slitlamp observations; Management of foreign bodies in the eyeball; Management of problems of cataract surgery; and Diagnosis and treatment of diseases of the cornea.

The interest manifested in such instruction has led to the policy of including it in connection with each annual meeting.

Edward Jackson.

CORRESPONDENCE

To insure permanent detachment of
the root of the iris in glaucoma
operations

January 15, 1936.

Editor,

American Journal of Ophthalmology:

In the January, 1936 number of the American Journal of Ophthalmology appears an article by Drs. Barkan, Boyle, and Maisler entitled, "On the surgery of glaucoma: Mode of action of cyclodialysis." In this article the authors stress the point that the successful cases were those in which the root of the iris and ciliary body remained permanently detached, allowing the drainage of the aqueous through this cleft into the suprachoroidal space. They further state, and correctly so, that in those cases in which the iris root re-adheres the tension rises post-operatively.

I am very much surprised that the

authors made no mention of the operation reported a few years ago by Dr. Herbert Wootton from the Manhattan Eye, Ear and Throat Hospital, in which he combined the cyclodialysis operation with iridectomy at the same sitting. By this method he successfully prevented that re-attachment which is responsible for poor results.

Dr. Wootton has retired from active practice and is on an extended vacation so that this article very likely will not come to his attention for some time. Accordingly, I am taking this opportunity of writing this to you because I assisted Dr. Wootton in his first operation of this sort and also successfully performed some myself. I hope that you will be kind enough to publish this explanation of Dr. Wootton's operation in an early number of the American Journal of Ophthalmology.

(Signed) Joseph Levine, M.D.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy and embryology

1. GENERAL METHODS OF DIAGNOSIS

Balcet, Carlo. The action of hydrochloride of methyloctenylamin on the eye. *Boll. d'Ocul.*, 1934, v. 13, Dec., pp. 1588-1601.

If instilled in from 2 to 10-percent solution in the conjunctival sac, the hydrochloride of methyloctenylamin, which has a relaxing action on nonstriated muscle, produces a mydriasis lasting about two hours. It irritates the conjunctiva for ten to fifteen minutes, provokes enlargement of the palpebral fissure and slightly increases ocular tonus, but does not disturb the accommodation. Thus it is useful in cases in which brief dilatation of the pupil is desired without paralysis of accommodation. (Bibliography.)

M. Lombardo.

Bücklers, Max. Luminous point of fixation on the hand perimeter. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 375.

The mirror in the center is replaced by an electric lamp to insure steadier fixation.

C. Zimmermann.

Castelli, A. Experiments and observations on the mydriatic action of some sympathicomimetic substances. *Arch. di Ottal.*, 1935, v. 42, March-April, p. 95.

Experiments on the eyes of rabbits, pigeons and man were performed with

sympathicomimetic substances including adrenalin and synthetic ephedrin. Results as to mydriasis, ocular tension, accommodation, and vascular reaction are given. Ephedrin 5 percent with 8 to 10 drops of adrenalin (1 to 1000) in 20 c.c. to reduce hyperemia gives the most constant mydriasis for ophthalmoscopic purposes with the minimum effect on accommodation. (Bibliography.)

Herman D. Scarney.

Fry, W. E. Nitrocellulose of low viscosity used as an embedding medium for eyes that are to be sectioned. *Arch. of Ophth.*, 1935, v. 14, Sept., pp. 482-483.

The advantages of this method are more rapid and complete infiltration and embedding, less shrinkage, and thinner sections. The material is quite inexpensive.

J. Hewitt Judd.

Kolen, A. A. Red-free ophthalmoscopy with hard gelatin light filters. *Sovietskii Viestnik Opt.*, 1935, v. 7, pt. 1, p. 57.

Hard, colored gelatin filters prepared at the Leningrad Institute are used in ordinary direct and indirect ophthalmoscopy. The author finds this sort of red-free examination satisfactory for practical purposes.

Ray K. Daily.

Lagrange, H., and Lagrange, A.-M. Isolated abolition of the reflex pupillary adaptation to light. *Symptomatologic*

value of Argyll Robertson sign. *Ann. d'Ocul.*, 1935, v. 172, Aug., pp. 631-672, and Sept., pp. 729-774.

This is a comprehensive monograph on the Argyll Robertson syndrome. Five of Argyll Robertson's original observations (1869 A.D.) are reproduced. In 1899 Babinski associated the syndrome with neurosyphilis. Tables compiled by numerous observers are given to show the incidence of the syndrome in various forms of nervous involvement. From 30 to 60 percent of neurosyphilitics have an Argyll Robertson pupil. Toxic, meningitic, and ischemic factors are considered as possible causes.

The Argyll Robertson syndrome occurred in a number of nonsyphilitic conditions especially after trauma to brain, eyeball, orbit, or cervical or thoracic cord. The presence of the syndrome may have some localizing value in brain tumors. It has been encountered in tumors involving the pineal body, the tegmentum of the cerebral peduncles, the region of the corpora quadrigemina, the third ventricle, and the aqueduct of Sylvius; as well as in multiple sclerosis, syringomyelia, encephalitis, herpes zoster ophthalmicus, meningitis, various febrile conditions, intoxication by quinine and alcohol, and various organic psychoses.

The Adie syndrome, consisting of bradycoria and loss of tendon reflexes, with negative blood and spinal serology, is discussed in relation to its confusion with loss of photomotor reflex in neurosyphilis. John C. Long.

Mann, W. A., Jr. Newer developments in photography of the eye. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1039-1044.

Marchesini, E., and Ghio, A. Radiographic studies of the orbital pyramid by introduction of opaque substances. *Ann. di Ottal.*, 1935, v. 63, Sept., p. 662.

The authors have experimented with lipiodol, and other X-ray-opaque substances. The first three substances gave negative results. With thorotrast they obtained good results as to regularity of the radiographic picture as well as

to perfect tolerance on the part of the tissues. They suggest this technique for more accurate study of retrobulbar new formations. The experiments were for the most part made on rabbits, but in two instances the method was used on human subjects. (6 tables, bibliography.) Park Lewis.

Mayer, L. L. Light stimuli of minimal measured duration as a means of perimetry. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 451-553.

A new practical instrument utilizing a rapid red neon flash as a perimetric target has been devised. It was found that field defects were exaggerated by this method, and seventeen perimetric charts are presented to illustrate this. The technique is simple, the flash definite, and the instrument is such that bed patients can be easily examined. J. Hewitt Judd.

Rivas Cherif, M. Photophthalmograph. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, Sept., pp. 472-479.

With this new camera, by virtue of a special arrangement of the axes of observation and illumination, it is possible to photograph peripheral areas of the fundus which could not hitherto be reached with similar apparatus. A special arrangement eliminates the light reflex. (7 illustrations.) R. Castroviejo.

Sniakin, P. G. A method for studying changes in the size of the blind spot. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 826.

After a review of the literature the author discusses his own findings in two hundred examinations, using a campimeter of his own design. He points out that the size of the blind spot varies physiologically and may range from 28 to 10 c.c. at a half-meter distance. It varies especially with the weather, reaching the maximum in cloudy and the minimum in clear weather. Ray K. Daily.

Strampelli, Benedetto. Ophthalmoscopic examination with polarized light. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 595-599.

A Nicol A prism which polarizes the light linearly is connected with a common electric ophthalmoscope. Direct and indirect examination can be made. The advantages are that the reflexes coming from the dioptric media, from the central macular region, and from other parts of the fundus, as well as the central white reflex of the blood vessels, are eliminated, and that some abnormal conditions are more sharply distinguished. (7 figures.) M. Lombardo.

2. THERAPEUTICS AND OPERATIONS

Beer, Leon. The use of argocal in ophthalmology. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 654.

The author recommends the use of this derivative of silver nitrate, manufactured in Poland, because it is much cheaper than argyrol. Ray K. Daily.

Bender, A. Pantocaine and its noxiousness. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 251. (See Section 16, Injuries.)

Cepero, G., and Comas, C. Ophthalmodiathermy and the arsenobenzols. *Rev. Cubana Oto-Neuro-Oft.*, 1935, v. 4, May-Aug., p. 85.

The use of diathermy has been found of benefit in the treatment of luetic eye involvement and in the prevention of local eye reactions attendant upon specific antiluetic treatment.

M. Davidson.

Daminskii, D. C. Gravidan in the therapy of ocular diseases. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 204.

This is a detailed discussion of the pituitary hormones and a report of nine cases of various ocular lesions treated with injections of gravidan-sterilized urine of pregnant women. The effect was improvement in general condition, increase in weight, increased percentage of hemoglobin, and better mental condition. Locally there was amelioration of the subjective symptoms, without arrest of the pathologic process. On glaucoma the effect was entirely negative.

Ray K. Daily.

Disler, H. H., Grinko, E. P., and Shadskaja, O. The use of the benzyl ester of cinnamic acid in the treatment of ocular diseases. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 813.

A detailed report of four cases of suppurative keratitis, two of scrofulous keratitis, and eight of trachoma treated with intramuscular injections of 3.2 percent solution of the benzyl ester of cinnamic acid. The authors noted improvement in the general well-being of the patient, and absence of local or general reaction. Improvement in the ocular condition, manifested as an active hyperemia with new blood-vessel formation, had to be admitted in spite of a very critical attitude. This effect was more pronounced on the cornea than on the conjunctiva. Ray K. Daily.

Fiore, Tito. Action of urea on the hemato-ophthalmic barrier. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 549-552.

A few rabbits were injected with solutions of coloring substances which usually do not pass from the blood into the aqueous. In this first series of experiments the aqueous did not contain any of these substances. But when pure urea had been added to the solution to be injected, the coloring substance was found in the aqueous. The writer noted also that a greater amount of salvarsan was found in the aqueous if urea had been added to the solution to be injected. He concludes that some diuretics increase the permeability of the hemato-ocular barrier. (Bibliography.)

M. Lombardo.

Gala, A. Diocaine and idiosyncrasy. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 1, pp. 39-46.

Over a ten-year period the author used diocaine for superficial anesthesia in thousands of cases for various purposes, including tonometer readings. It never increased intraocular pressure, even in cases of glaucoma. One case of glaucoma showed an idiosyncrasy for the drug. The patient developed acute conjunctivitis with secretion, edema of the lids, blepharospasm, itching, and burning, lasting for six days.

Georgiana Dvorak Theobald.

Gala, A. The cause of insufficient local anesthesia with cocaine. *Ceskoslovenska Osth.*, 1935, v. 2, no. 2, pp. 87-92.

Two drops of 5-percent cocaine in normal salt solution were instilled into the conjunctival sac every three minutes for seven instillations. The sac was then irrigated with normal salt solution. Aqueous was withdrawn and was tested quantitatively for cocaine by the colorimetric method with Mayer's reagent (HgCl_2 and KI). The author found almost equal amounts of cocaine in the aqueous of an inflamed eye (iridocyclitis, keratoconjunctivitis, glaucoma) and in the aqueous of an eye normal except for optic nerve atrophy. He concludes therefore that the cause of slight and insufficient anesthesia of an irritated eye depends upon the character of the inflammation, and not on lessened absorption by the tissues and blood vessels. In an irritated eye, the tissue is more sensitive and so for complete anesthesia needs a greater amount of anesthetic or another method of application than instillation.

Georgiana D. Theobald.

Germer, O. I., and Kulieva, M. X. Carotin in ophthalmology. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 159.

From comparison of the various preparations of carotin used in Russia, the author is impressed by the relief from pain and blepharospasm following instillations of carotin into the conjunctival sac. It also hastens recovery and has an anesthetic effect on the cornea.

Ray K. Daily.

Guerrieri, Guerriero. Contribution to the knowledge of permeability and diffusion phenomena of the cornea. *Boll. d'Ocul.*, 1934, v. 13, Dec., pp. 1545-1587.

Experiments were made on 34 rabbits to determine whether diffusible substances instilled or injected subconjunctivally or hypodermically could be found in the cornea. As diffusible substances the ferrocyanide of potassium, and potassium iodide in solutions hypertonic, hypotonic, or isotonic to the aqueous, were used, and to detect their presence a solution of iron perchloride,

and a mixture of starch, sodium hyponitrite, and sulphuric acid, were used respectively. The experiments were conducted on intact cornea, on cornea with abraded epithelium, or on ulcerated cornea. Hypotonic and hypertonic solutions were found in the cornea and even in the aqueous in all the experiments. Isotonic solutions if instilled spread toward the interior of the eye with abraded epithelium, or if used subconjunctivally or hypodermically. Very small traces were found in the infiltration around the ulcerated cornea. The writer concludes that an instilled substance spreads toward the interior of the eye through the cornea and that the corneal epithelium regulates the diffusion. (Bibliography, 4 photomicrographs.)

M. Lombardo.

Jacobson, J. The use of the benzyl-ester of cinnamic acid in ophthalmology. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 808.

The benzyl ester of cinnamic acid neutralizes in vitro a lethal dose of tuberculin, diphtheria, or tetanus toxin. It dilates the peripheral and central blood vessels, arrests bacterial growth, stimulates leucocytosis, and hastens cicatrization. In ophthalmology it was first tried in trachoma, after the observation that trachoma had spontaneously improved in an Algerian treated for tuberculous adenitis. Its application to the treatment of trachoma in Tunis demonstrated its value. It was also found useful in keratitis.

Ray K. Daily.

Kaminskaja, Z. A. A method of study of the blood vessels of the anterior ocular segment. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 59.

The author found that diathermy produced hyperemia lasting 30 to 35 minutes. After its use in parenchymatous keratitis, blood vessels with circulating blood could be seen in the cornea where none had been seen previously. Slitlamp study of the blood vessels of the cornea and limbus should be repeated after application of diathermy.

Ray K. Daily.

Kasas, I. I. Five mistakes in the treatment of ocular syphilis. *Sovetskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 230.

These are failure to begin the treatment with mercury, the dangerous use of provocative injections, insufficient medication, monotherapy, and standardized dosage. The author uses a carefully determined course of treatment for each patient, taking into consideration general condition, social environment, and tolerance for drugs. He ridicules the standardized dosage of the German school, determined by vote of the syphilis commission, and not based on scientific data. Ray K. Daily.

Katz, Dewey. A new bandage for the eye especially recommended for use after intraocular operation. *Arch. of Opht.*, 1935, v. 14, Aug., pp. 263-265. (Drawings.)

A Fox aluminum shield is fastened to the skin of the cheek by two or more strips of adhesive tape, and to the brow by two or more other strips with their lower ends turned under. To change the dressing the upper strips are pulled loose from the shield, which can then be turned down with the lower strips as a hinge. J. Hewitt Judd.

Landes-Leinerowa, L. X-ray therapy of ocular diseases. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 514.

In ocular inflammations such as iritis, conjunctivitis, dacryocystitis and parenchymatous keratitis the author at first used X rays only after all other therapeutic measures had failed. Having obtained good results in 50 to 80 percent of such cases she is very enthusiastic about X-ray therapy in all inflammatory diseases of the eye and its adnexa. The dosage is 80 to 100 R., 100 to 180 K.V., treatment at five to ten day intervals, the total dosage for six months not to exceed an erythema dose.

Ray K. Daily.

Levine, Joseph. Use of Coley's mixed toxins in ophthalmology: further observations. *Arch. of Opht.*, 1935, v. 14, Oct., pp. 554-556.

The preparation known as Coley's mixed toxins is a vaccine made from

killed cultures of *Streptococcus erysipelatis* and *Bacillus prodigiosus*. It is used as a foreign protein, and administered intramuscularly in doses of from one to six minims, depending on the weight and condition of the patient. The reaction comes on after six hours and consists of chills and a fever ranging from 101 to 103°F. No complications have followed several hundred injections. The product is extremely cheap, a three-minim dose costing less than five cents. J. Hewitt Judd.

Liebermann, L. Technical details of eye surgery. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 305.

For disinfection of the hands the author recommends brushing for five minutes with a hypochlorite paste (magnosterin), which constantly liberates free chlorine. For illumination he uses a head lamp with lenses of 2-cm. focus. For iridectomy in glaucoma with shallow anterior chamber he incises the limbus from without with a scalpel.

C. Zimmermann.

Mayer, L. L. Larocaine, a new anesthetic. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 408-411.

This synthetic drug is the p-amino-benzoyl ester of 2,2-dimethyl-3-diethyl-amino-1-propanol, and is akin to procaine and tutocaine. When instilled it produces no change in pupil, accommodation, or tension. A chart shows the anesthesia (as tested with Frey's hairs) obtained in the normal human cornea with solutions varying from 1 to 40 percent. Clinical use has given excellent results. J. Hewitt Judd.

Melanowski, W. H. The eye and radiant energy. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 492.

A review of the literature relative to physical properties of the various light rays and their effect on the eye.

Ray K. Daily.

Narog, Franciszek. Further studies on the therapeutic effect of ultraviolet rays and the high frequency current in ocular affections. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 532.

On the basis of 150 cases treated with ultraviolet rays the author concludes that this treatment should be resorted to only after all other therapeutic procedures have failed. The Birch-Hirschfeld lamp is most effective in tuberculous lesions of conjunctiva, cornea, and iris. In corneal ulcers it is only an auxiliary and is indicated principally to raise the local defenses in allergic individuals and those of lymphatic diathesis. General irradiation with the quartz lamp is indicated in scrofulous lesions. Local irradiation with the quartz lamp gave good results in three cases of elephantiasis of the lids, and in several cases of blepharitis and trachoma. The author found high frequency quartz electrodes beneficial in dystrophies of the cornea, muscular paralyses, hemophthalmos and uveitis. Diathermy coagulation may be used for small growths, trachomatous hypertrophies, pigment spots, and excision of the lacrimal glands and of prolapsed iris, as well as in retinal detachment.

Ray K. Daily.

Pereyra, Giorgio. Medical and surgical diathermy in ophthalmology. *Boll. d'Ocul.*, 1935, v. 14, Feb., pp. 254-265.

The writer reviews the progress of medical and surgical diathermy in clinical applications and therapeutic results. Among surgical applications he mentions a method for optical iridectomy by Schmerl, Lacarrère's method of intracapsular extraction of cataract, and the recent application to detachment of the retina. M. Lombardo.

Poos, F. Paradoxical mydriasis with stimulants of the sympathetic, resembling adrenalin. *Graefe's Arch.*, 1935, v. 134, p. 268.

A satisfactory explanation can not yet be given for so-called paradoxical mydriasis from adrenalin or the elevated threshold from instilling a solution of adrenalin 1 to 1000 on the side of a sympathetic paralysis or in an animal on the side where the superior cervical ganglion has been extirpated. The author found in human beings and rabbits that sympatol, corbasil, ephetonin, icoral, oxin, tyramin, ergotamin, and

orasthin, that is substances resembling adrenalin in their action on the blood vessels, heart, and bronchial and other smooth musculature, produced a similar mydriasis under the same conditions. Cocaine was the only one of such substances not causing the same response.

H. D. Lamb.

Promtov, V. A. A new anesthetic—diotan. *Sovietskii Viestnik Ophth.*, 1935, v. 6, pt. 6, p. 836.

The Soviet Chemico-pharmaceutical Institute has developed a synthetic local anesthetic with formula $C_2H_{27}O_4N_3HCL$ and patented under the name of diotan. This report of the experimental and clinical investigations shows that a solution of diotan is stable and is not impaired by boiling; does not widen the palpebral fissure, paralyze accommodation, dilate the pupil, injure the superficial corneal epithelium, or raise intraocular tension; is very slightly toxic in comparison with cocaine; and produces satisfactory anesthesia. It has the unpleasant features of producing a burning sensation and of dilating the conjunctival blood vessels.

Ray K. Daily.

Sitzimkopfova, Helena. Attributes of sodium-evipan narcosis. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 1, pp. 46-50.

The author reports clinical experience with sodium-evipan in 39 cases of eye surgery. The age of the patients varied from one to 87 years. There were no contraindications to use of evipan. The dosage varied from 1.5 to 10 c.c. Respiration, pulse and blood pressure remained without marked change. The sleep was quite deep, of short duration, and without subjective or objective disturbance. Great postoperative restlessness, of long duration, was observed in four children.

Georgiana Dvorak Theobald.

Talkovskii, S. T. The neurotropic theory of Speranskii and novocaine blocking in ophthalmology. *Sovietskii Viestnik Ophth.*, 1935, v. 7, pt. 1, p. 3.

In eighty cases the usual treatment was augmented by novocaine blocking in the periadrenal fascia, according to

the method of Vishnevskii. Only one blocking was administered in each case, and 36 percent of the cases thus treated were benefited. The treatment was most effective in incipient inflammatory processes, with edema and serous exudation predominating. The rapid disappearance of edema and amelioration of the inflammatory reaction were striking. In a number of cases in the stage of suppuration the diseased area became sharply demarcated from the healthy tissue and the purulent focus or infiltrate seemed to melt away.

Ray K. Daily.

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Ames, Adelbert. Aniseikonia—a factor in the functioning of vision. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1014-1019.

Anastasi, Licio. Unilateral myopia. *Boll. d'Ocul.*, 1935, v. 14, March, pp. 328-351.

From a study of 1,541 cases of unilateral myopia the writer comes to the following conclusions. It represents a congenital anisometropia or it manifests itself in the first decades of life. It is more frequent in the female sex (sixty percent). Corneal opacities are a cause of development of low unilateral myopia. Divergent strabismus frequently occurs. Heredity and school work are among the most frequent causes. In a small percentage of the cases the refractive defects may be corrected. (Bibliography.)

M. Lombardo.

Baschenov. Inability to close one eye. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 870.

Inability to close one eye was found in twenty percent of nine hundred men examined. Of these 78 percent could not close the right eye alone, 17 percent the left eye alone, and five percent either eye alone. This inability must be of cortical origin and represents an atavistic phenomenon. From a practical standpoint it is of importance in sharpshooters, who usually close the left eye while focusing with the right, and in drivers of vehicles, who may find it

necessary to close an injured eye while getting to a place of safety under guidance of the other eye. Ray K. Daily.

Bertotto, E. Contact glasses, their use and their present status. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 484.

The Dallos method of making individual molds of the eye and making the contact glass to measure is described. M. Davidson.

Biffis, Andrea. Position of the iridic diaphragm in the eye. *Boll. d'Ocul.*, 1935, v. 14, Feb., pp. 288-295.

The author studied the proper position of the iris in a schematic eye in order to eliminate the sagittal halo with its aberration, which interferes with distinct vision. By mathematic calculations the place of election of the normal and real pupil was found to be at 3.65 mm. behind the corneal vertex. This position affords clear vision and makes the normal eye a perfect organ. (Bibliography.) M. Lombardo.

Cori, R. de. Considerations and calculations on the depth of the visual field. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 753-767.

The writer calculates the depth of the visual field, demonstrating that this is in relation to the distance of the object, the diameter of the pupil, and the wave length of light. Practically, however, binocular vision is greatly influenced by the psychologic factor.

M. Lombardo.

Gifford, S. R. Some notes on the treatment of strabismus. *Trans. Pacific Coast Oto-Ophth. Soc.*, 1934, 22nd annual meeting, p. 165.

Early diagnosis and treatment are important to determine whether fusion training will benefit. Refraction with cycloplegia is always indicated first. The author believes that fusion is not absent in alternating squint but is under-developed. About 30 percent of the cases, especially those due to accommodative errors, may be corrected by refraction and occlusion plus orthoptic training. The lower degrees of squint,

especially under fifteen degrees, respond much more readily to this treatment. Operation is advised at any age when the results obtained by the above methods have been exhausted. Stress is placed on the advantages of operating upon both lateral recti of the same eye at the same time. M. E. Marcove.

Herzog, Max. On refraction and prescribing of glasses in the U.S.A. *Zeit. f. Augenh.*, 1935, v. 87, August, p. 37.

Herzog, working in the private office of a representative American oculist, is impressed with the exactness of American methods of refraction and the correction of very small errors. The optometrist who does refraction is unknown in Germany. The author describes a routine method of refraction which includes preliminary subjective tests with trial lenses, examination under cycloplegia, postcycloplegic test, and checking the adjustment of the frame he finds noteworthy. Almost complete neglect of the ophthalmometer. Hyperopia is corrected much more frequently than in Europe, and full correction of myopia is more usual. (See also editorial, *Amer. Jour. Ophth.*, 1935, v. 19, Jan., p. 54.)

F. H. Haessler.

Holth, S. Kinescopy—objective and subjective. *Brit. Jour. Ophth.*, 1935, v. 19, Nov., p. 603.

This apparatus for the determination of the principal meridians in astigmatism has an adjustable standard, and suspended from the standard by an arm is a target in the center of which is a disc 2.5 cm. in diameter with a 5-mm. light opening in its center. This opening is to be placed on a level with the patient's eye. Projecting from this black central disc is a white meridian pointer 5 mm. wide and about 18 cm. long, on a black rotating disc. Around the periphery are markings indicating the axis. The central "light opening" is in immediate contact with the center of the wall of a frosted 75-watt electric lamp. By rotating the axis of this light streak the axis of astigmatism is determined. D. F. Harbridge.

Ladekarl, P. M. Color distinction in the normal and in the color blind. *Acta Ophth.*, 1934, Supplement 3.

This very exhaustive study contains a comprehensive review of the literature and a detailed report of the author's own investigations. He claims greater accuracy because Ascher's apparatus permits simultaneous adjustment for color and intensity, not possible with the equipment of former investigators. The measure of perception was the average error of forty tests at each wave-length tested. The perception curves plotted from the tests show two areas of maximum perception for trichromates and one for dichromates. Other areas reported by former investigators the author attributes to errors in technique. Both the trichromates and the color blind show an area of maximum perception at 480 microns in the blue-green field. The curve of the trichromates shows another area towards the red end of the spectrum at 580 microns for the normal, at 600 for the green defective, and at 570 for the red defective. The perception of the protanomalope falls rapidly and markedly towards the red end of the spectrum, while the deuteranomalope is capable of perceiving there more shades of red than the normal. Between 657 and 635 microns the trichromate distinguishes 111 shades, while the deuteranomalope distinguishes only 65 shades, in spite of his superior ability in the red field. The interrelation of various types of defects in color vision is shown by a mathematical computation from perception curves for the various colors. The tests for maximum intensity in the spectrum for each type of color vision show that the maximum intensity of the deuteranope is further in the red end of the spectrum than for the normal, and further for the deuteranomalope than for the deuteranope. In the protanope the area of maximum intensity is shifted toward the violet end of the spectrum and the shift is greater in the protanomalope. The perception curves of three women, who carried the color-defect-containing chromosome, and who were generally believed to have normal color

perception, demonstrated reduced sensitivity in the entire spectrum, particularly marked in the green and blue-green fields. The color matching and intensity curves, however, showed no deviation from the normal.

Ray K. Daily.

Lipschutz, Hermann. *Myopia and near work*. Brit. Jour. Ophth., 1935, v. 19, Nov., p. 611.

The question of the influence of near work in the development of myopia is not yet satisfactorily answered. Most theories explain the bad influence as due to pressure exercised by the horizontal muscles. This paper deals with congestion of the venous outflow from the eye and orbit in the stooping posture. The author studied the venous congestion within the eye by examining the venous pulsations which occurred when the head was bent extremely forward.

D. F. Harbridge.

Moore, R. *Subjective "lightning streaks."* Brit. Jour. Ophth., 1935, v. 19, Oct., p. 545.

This communication calls attention to a fairly common phenomenon. The occurrence of light flashes is compared to lightning. It is experienced periodically for a few weeks or months, most frequently in the dark, is referred to the temporal side and followed by spots before the sight. During the past two years this observer has studied twenty-six cases. His conclusions are that the symptoms are not indicative of any serious fundus changes or field defects. While he has no definite explanation to offer he is inclined to believe that the most likely cause is a gradual increase in size and then rupture of a peripheral cyst.

D. F. Harbridge.

Muselevich, A. L., Zundeleovich, P. I., and Fradkina, M. I. *Constitution, myopia, and vocation*. Sovetskii Viestnik Opht., 1935, v. 7, pt. 2, p. 240.

From records of six thousand and five workers examined at the Institute of Hygiene and Labor, the author sought to correlate myopia to flat feet, type of

constitution, and occupation. The tables show no relation of myopia to flat feet or type of constitution as claimed by Kushel. They show definitely a relation between myopia and work. In occupations requiring the use of the eyes for near work 24.14 percent of the workers were myopic, while only 14.28 percent of workers in other occupations were myopes.

Ray K. Daily.

Ochapovsky, S. *Genesis of the refraction of the human eye*. Arch. of Ophth., 1935, v. 14, Sept., pp. 412-420.

The author presents the theory that the refraction of the eye at different periods of life is an ontogenetic expression of the regularity of individual development. Variations in the refractive state of different persons are phylogenetic expressions of the development of the genus. The author is convinced that environment and occupation have little to do with the changes in the refraction of any individual.

J. Hewitt Judd.

O'Rourke, D. H. *How I do a refraction*. Trans. Pacific Coast Oto-Ophth. Soc. 1934, 22nd annual meeting, p. 113.

This very practical discussion of routine procedure is well worth reading. (Discussion.)

M. E. Marcove.

Pascal, J. I. *Myopia and exophoria*. Arch. of Ophth., 1935, v. 14, Oct., pp. 624-626.

Exophoria may produce axial myopia through compression of the globe by the extraocular muscles, and a "tonic" myopia by constant overstimulation of accommodation resulting from constant overstimulation of convergence in children having a "tight hook-up" between these. Stereoscopic exercises to weaken this association are advised as prophylaxis.

J. Hewitt Judd.

Rolett, D. M. *Is full correction of value in checking the progress of myopia?* Arch. of Ophth., 1935, v. 14, Sept., pp. 464-472.

This report is based on the study of 772 myopic patients. The condition was progressive in 565, and of these 220

were classed as malignantly progressive. Despite full correction, 73 percent showed advance of myopia and complications were just as common. In the advanced progressive class only 1.7 percent retained normal vision. The author concludes that proper correction has little or no influence on the progress of myopia.
J. Hewitt Judd.

Samoilov, A. I. Clinical studies in color vision. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 200.

A detailed report of the findings in a fifteen-year-old monochromate, tested on the anomaloscope and the Hess disc. The difference between the size of the pupil in this monochromate and in a normal person is shown graphically. Her parents were cousins, but they as well as the patient's three brothers had normal color vision. Ray K. Daily.

Weintraub, J. D. Retinoscopy at a definite distance. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 458-463.

The author presents two graphs which show the relationship between diopters and focal distance and the rate at which the diopters change as the distance changes. He emphasizes the need of accuracy in distance to minimize errors in retinoscopy and describes a cord which is divided by beads into lengths representing the various dioptric values.
J. Hewitt Judd.

Wilson, J. A. Ametropia and sex. *Brit. Jour. Opht.*, 1935, v. 19, Nov., p. 613.

Of 22,000 school children with defective vision, 57.9 percent were girls. They were arranged in groups as to myopia and hyperopia, and also in age groups, below seven years, seven to ten years, and eleven to fourteen years.

In the age group of 300 children below seven years, eight were hyperopic to one myopic, the hyperopia being as much as 8 D. and the myopia as much as 12 D. Between 7 and 10 years, there were 4.6 cases of hyperopia to one of myopia; from 11 to 14 years, 3 cases of hyperopia to one of myopia; from 15 to 17 years (53 males and 41 females) hyperopia and myopia reached parity. The result of the study may or may not

show some relation between amount of study and increase in myopia. Previous studies had indicated that where a father or mother was myopic, that parent transmitted myopia to two girls for one boy.
D. F. Harbridge.

Zentmayer, William. Voluntary control of accommodation. *Amer. Jour. Opht.*, 1935, v. 18, Dec., pp. 1134-1136.

4. OCULAR MOVEMENTS

Fisher, E. M. The technique of tenorrhaphy. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 122.

This is a description of a muscle resection operation with one mattress suture through conjunctiva and muscle.
Ray K. Daily.

Kahoun, Svatopluk. Etiology of paralysis of external eye muscles. *Ceskoslovenska Oft.*, 1935, v. 2, no. 2, p. 96-102.

In the Brno eye clinic, during the years 1929 to 1933, there were 64 cases of paralysis of external eye muscles. The etiology was as follows: lues 12, arteriosclerosis 15, trauma 7, general infections 7, congenital 7, tumor in the base of the cranium and brain 6, tumor in the orbit 2, inflammation of nasal sinuses 2, hemiencephalitis 1, encephalitis 1, ophthalmoplegia (progressive chronic) 1, hemiplegia 1, unknown 2.

Twenty-two percent of these cases were cured; 37 percent were improved; in 41 percent no improvement was obtained. The abducens was most frequently involved, the trochlearis seldom. In more than one-half the cases, more than one nerve were paralyzed at the same time.

Georgiana D. Theobald.

O'Connor, Roderic. The recession operation—a criticism. *Amer. Jour. Opht.*, 1935, v. 18, Dec., pp. 1137-1139.

Pol, W. Comparative evaluation of the Maddox rod and the Armbruster diploscope in heterophoria. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 577.

The Maddox-rod test shows the degree and type of heterophoria, while the diploscope determines only the

type. The diploscope has the merit of demonstrating the presence of binocular vision and fusion. In studying the effect of heterophoria on depth perception the author found that a difference of four degrees in deviation for distance and near, or exophoria of four degrees or esophoria of three degrees for distance, had no effect on depth perception.

Ray K. Daily.

5. CONJUNCTIVA

Anelli, Dante. A preparation of colloidal zinc in the treatment of induced catarrhal conjunctivitis. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 669-673.

In experiments on rabbits by subconjunctival injection of cultures of staphylococcus, streptococcus, and pneumococcus, followed by deep scarifications of the conjunctiva, instillation of colloidal zinc caused rapid clearing of the conjunctivitis. M. Lombardo.

Charlin, Carlos. Masked trachoma. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 609-618.

The author reports twelve cases of an attenuated, benign form of trachoma, manifesting itself either by simple photophobia; by symptoms of chronic catarrhal, follicular, or eczematous conjunctivitis, blepharoconjunctivitis, or relapsing ulcerous keratitis; by ptosis, entropion, and trichiasis; or by an apparently simple dacryocystitis. Some of these symptoms yield readily to copper sulphate. The main differential feature consists in a pannus found upon slit-lamp examination. (4 figures.)

M. Lombardo.

Gowen, G. H. The dissociative influence of the normal rabbit conjunctiva on beta hemolytic streptococci. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1140-1143.

Khorazo, D., and Thompson, R. The bacterial flora of the normal conjunctiva. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1114-1116.

Kolacny, Jaroslav. Local therapy of trachoma with Estaban's vaccine. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 112-114.

Because Esteban had reported 34 of 42 cases of trachoma cured by use of a vaccine, the author tried this form of therapy in 18 cases of bilateral trachoma. The vaccine was prepared from trachoma granules macerated in physiologic salt solution, kept at 37° C. for 24 hours, then inactivated at 60° C. for a half-hour. The solution was instilled into the conjunctival sac daily for three weeks, and once a week the conjunctiva was well rubbed with a cotton applicator. No improvement was noted that could not be attributed to atropin used where indicated.

Georgiana D. Theobald.

Markiewicz, Stanislaw. Methyl antigen in the treatment of trachoma. *Klinika Oczna*, 1935, v. 3, pt. 3, p. 649.

A report of five cases of trachoma treated successfully with methyl antigen, an antituberculous antigen used in Poland.

Ray K. Daily.

Nastri, F. Purulent conjunctivitis and palpebral pyodermatitis from micrococcus catarrhalis. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 674-687.

A male child of nine days, luetic, showed facial dermatitis and purulent conjunctivitis. Bacteriologic examination revealed *Micrococcus catarrhalis*. Excoriations of the skin during delivery with face presentation, and poor general condition, contributed to the rare localization of this germ from the vaginal canal. (Bibliography, 3 figures.)

M. Lombardo.

Possenti, G., and Castrignani, G. Etiology and pathologic anatomy of pterygium. *Ann. di Ottal.*, 1935, v. 63, Sept., p. 699.

The authors made biomicroscopic and histologic studies on a series of stationary and progressive pterygium. They review in detail the various existing hypotheses, and conclude that the inflammation theory is most acceptable. (One plate, bibliography.)

Park Lewis.

Robbins, A. R. Role of Bacterium granulosis in trachoma. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 629-640.

Over one hundred articles have been written on this subject. The organism was found to be morphologically and biologically unstable. It was difficult to isolate and grow, lost virulence rapidly, and produced few if any antibodies. Noguchi isolated this bacterium from cases of trachoma and with it produced granular conjunctivitis in monkeys. But Lindner and others did not believe this granular conjunctivitis to be identical with trachoma. Experimental transfer of *Bacterium granulosis* to the human conjunctiva has failed to produce trachoma. The author therefore believes that at present at least *Bacterium granulosis* cannot be considered the cause of trachoma.

J. Hewitt Judd.

Szer, Rosa, and Zachert, Margan. A report on the work of the antitrachomatous dispensary of the First Center of Hygiene in Warsaw. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 657.

A detailed report of the work accomplished since 1932.

6. CORNEA AND SCLERA

Focosi, M. Considerations on the pathogenesis of filamentary keratitis. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 619-640.

In a man of 68 years, a fine filament 4 mm. long, with a large roundish free end and surrounded by a mucous mass, was adherent to the infero-external paracentral sector of the right cornea. Under the microscope its base appeared to be formed by flat round or polygonal cells with abundant protoplasm and round nuclei, while the filament consisted of an amorphous mass including elongated nuclei. A man of 50 years showed a similar filament implanted at the level of a wound in the inferior sector of the cornea. (Bibliography, 5 figures.)

M. Lombardo.

Caevich, E. P. Treatment of corneal lesions by the method of Speranskii. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 36.

The author treated twenty corneal lesions with a marked neurotropic component, such as discoid keratitis, corneal herpes, and recurrent erosions,

with novocain blocking of the periadrenal tissue according to the method of Vishnevskii. Brief case histories show the favorable effect of the treatment on keratitis with a definite neurotropic factor. The effect was less pronounced in scrofulous keratitis, and there was practically no effect on serpiginous ulcer and fascicular keratitis. The author concludes that this treatment acts by raising the general biologic defences of the body and that it should be used in conjunction with other therapeutic procedures.

Ray K. Daily.

Goldfeder, A. E. The technique of chondroplasty in trachomatous pannus. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 131.

The author's operation consists in the implantation of a piece of the auricular cartilage around the limbus. In comparison with Denig's operation the author claims for this procedure greater technical simplicity, greater effectiveness, and better cosmetic appearance.

Ray K. Daily.

Grancini, L. E. An uncommon form of dendritic keratitis due to streptococcus partially hemolyticus. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 786-800.

A boy of five months was affected by marked parenchymatous infiltration of the entire right cornea and, near its margin at the nine o'clock meridian, by an oval loss of substance showing branches terminating in other smaller ulcers. The boy had been affected by eczema of the face and by infection of a couple of fingers of the right hand. The cornea recovered under general and local treatment. Cultures, endoperitoneal injection of mice, and inoculation of rabbit cornea with material taken from the boy's eye, face, and fingers indicated that the corneal lesion was due to autoinoculation with a streptococcus partially hemolytic and weakly pathogenic. (Bibliography, 10 figures.)

M. Lombardo.

Herbert, H. The precise origin of corneal pitting. *Brit. Jour. Ophth.*, 1935, v. 19, Nov., p. 600.

This contribution is to correct the impression that the author "is not in

agreement with the view that follicles are the antecedents of Herbert's peripheral pits." The root cause of pitting however is not thus explained. Clinical developments, ranging up to the deepest trachomatous pits, seem traceable back in some measure to the primary and fundamental influence of relatively small, exceptional, isolated limbal resistances.

D. F. Harbridge.

Irvine, A. R. Some aspects in the treatment of ulcers of the cornea. *Trans. Pacific Coast Oto-Ophth. Soc.*, 1934, 22nd annual meeting, p. 154.

Three case of corneal ulcer were treated by various procedures. The author emphasizes the effect of overtreatment and of the continued use of local anesthetics. The advantages of foreign protein injections and of the thermophore in selected cases are discussed. The helpfulness of a binocular bandage and of the use of collodion to keep the eyes closed is stressed. (Discussion.)

M. E. Marcove.

Kitaeva, A. Prognosis and treatment of parenchymatous keratitis. *Sovietskii Viestnik Ophth.*, 1935, v. 7, pt. 1, p. 143.

On the data of 112 cases the author concludes that parenchymatous keratitis never leads to complete blindness, that patients should be hospitalized, and that mercurial inunction is an effective antiluetic measure.

Ray K. Daily.

Klien, B. A. Acute metastatic syphilitic corneal abscess. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 612-617.

A male patient aged 52 years was seen on account of a corneal abscess. The clinical findings were not correctly interpreted and the eye was removed because of pain. Later the patient was found to be luetic. Histologic examination revealed that repair was going on which would at least have led to preservation of useful vision. The corneal and uveal lesions are coördinate manifestations, because Descemet's membrane was found to be intact. The infection of the iris and cornea was probably metastatic. (Photomicrograph.)

J. Hewitt Judd.

Kluever, H. C. Streptococcal pseudomembranous conjunctivitis. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1094-1108.

Koslowski, Bogumil. Groenouw's nodular corneal dystrophy. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 551.

A woman of 29 years came because of corneal opacities. White nodules were found centrally in the middle and deep corneal layers, and a small number of opaque plaques superficially. The same condition was found in the patient's father, two sisters, and daughter. Three superficial segments of the cornea were excised 4 mm. from the limbus and were covered with conjunctiva in the hope of bringing blood vessels closer to the center of the cornea and stimulating its metabolic processes. Three months later the patient's vision had improved in the right eye from 5/20 to 5/15, and in the left from 5/35 to 5/10. (Review of literature, detailed histologic report, illustrations.)

Ray K. Daily.

Marchesini, E. The behavior of the scleral canals and their relation to the venae vorticosae at different ages. *Ann. di Ottal.*, 1935, v. 63, Sept., p. 689.

The author demonstrated thickening and increased density of the connective bundles especially in the deeper strata, based upon rarefaction of a number of fixed connective tissue cells associated with modification of the nuclei such as flattening or elongation. In relation to the canals provided for passage of the venae vorticosae the author was able to demonstrate in an important percentage circumscribed thickening of the pericanalicular tissues with occasional disappearance of perivascular connective tissue, especially in the transcleral portion. (Bibliography.)

Park Lewis.

Marmalevski, K. V. Surgical treatment of serpiginous ulcer. *Sovietskii Viestnik Ophth.*, 1935, v. 7, pt. 2, p. 256.

Relative to control of pain and to final visual acuity the author obtained better results by covering the curetted ulcer with a conjunctival flap than from any other procedure. Ray K. Daily.

Marquez and Velilla. On marginal degeneration of the cornea (Terrien's disease). *Arch d'Opht.*, 1935, v. 52, Oct., p. 707.

Reviewing the literature and describing two new cases of this disease, the author concludes that it is a special degeneration of the peripheral superficial layers of the cornea. This leads to thinning of the cornea, producing a groove in the early stages and an ectasia of the cornea in the last. Considerable astigmatism results. There is danger of rupture of the globe, either traumatic or spontaneous, at times with iris prolapse. The thinning of the cornea is consecutive to failure of nutrition, and this renders cicatrization of the lesion very difficult. (Illustration, bibliography.)
Derrick Vail.

Ochapovskii, S. V., and Sharkovskii, I. A. Pathologic physiology of the cornea. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 46.

Brief histories are given of thirteen cases of neuroparalytic keratitis, with a review of the literature relative to various theories on the pathogenesis of the disease.
Ray K. Daily.

Parlato, S. J. Corneal ulcers due to a common allergen. *Arch. of Opht.*, 1935, v. 14, Oct., pp. 587-590.

Corneal ulcers occurred in a nun aged 36 years, who was found to be very sensitive to orris root. She also reacted to dionin, the use of which was therefore discontinued. Her duties were changed so that she could avoid orris root preparations, and desensitization was carried out by subcutaneous injections of the root extract. The corneal lesions healed completely in a short time. The author believes the use of dionin contraindicated as a palliative treatment for corneal ulcers, because many allergic and nonallergic persons are sensitive to the drug.

J. Hewitt Judd.

Shapira, T. M. Lattice type of corneal dystrophy. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 387-391.

The findings in previously reported cases are summarized. Three cases

which occurred in members of the same family, two sisters and a son of one of them, are described. The condition is well shown in a stereophotograph.

J. Hewitt Judd.

Stastnik, Emanuel. Treatment of herpes zoster of the eye. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 114-116.

In treatment of five cases of corneal herpes zoster, in addition to local application of boric ointment and atropin, the author used two grains of sodium thiosulphate (20 percent solution) intravenously. The injections were given daily or every other day, according to the severity of the affection. Four to twenty-two injections were needed in different cases. The author has no theory as to the action of sodium thiosulphate on this disease. Because varicella and herpes appear to be related, he suggests that sodium thiosulphate be used in treatment of both diseases to check his results.

Georgiana D. Theobald.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Friedenwald, J. S., and Pierce, H. F. Circulation of the aqueous. 4. Reabsorption of colloids. *Arch. of Opht.*, 1935, v. 14, Oct., pp. 599-611.

Foreign or native colloids injected into the anterior chamber of the eye were absorbed with extreme rapidity. All such colloids were first actively phagocytized by the surface layer cells of the iris. Monocytes then appeared in the tissues and removed the colloid via the perivascular spaces of the perforating vessels of the sclera. Serum proteins were disposed of in the same manner except that in their removal proteolytic enzymes played a digestive part. This phagocytic activity of the surface cells of the iris is regarded as of importance in keeping the aqueous optically clear, and as explaining the ease of formation of peripheral anterior synechia in glaucoma.

J. Hewitt Judd.

Kuda, M. C. A clinical and histopathologic study of traumatic cysts of the iris. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 117.

One cyst developed in a young student seven years after injury. Its excision was followed by recurrence, which was treated by injection of 3 percent iodine into the cyst after opening it from the limbus. The cyst became obliterated. A rare feature of this case was pressure atrophy of the lens in the region of the original cyst. In the second case a bilobed cyst occurred in a child of six years, two years after injury. Serial sections of the enucleated eye showed that the two lobes intercommunicated. (Photomicrographs.)

Ray K. Daily.

McKee, S. H. Metastatic ophthalmia in a case of pneumonia: bacteriological findings. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., p. 1135.

Newton, F. H. Empirical treatment of uveitis. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 618-623.

A comprehensive résumé is given of the usual treatment of acute and chronic uveitis of unknown etiology, including combinations of mydriatics, either by subconjunctival injection or by instillation; foreign proteins, especially typhoid vaccine and whole milk; sodium-gold thiosulphate, intravenously; and the use of heat by diathermy, carbon light bulb, and infrared or "bath-room" electrical heater. The use of ethyl morphine hydrochloride is condemned.

J. Hewitt Judd.

Rumiantzeva, A. Treatment of sympathetic ophthalmia according to the method of Speranskii. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 27.

In pathologic processes Speranskii attributes the chief role to the neurotropic component, and he divides all pathologic processes into two groups. In one the pathologic process is a primary neurotropic disturbance. In the other the initial factor may be infection, trauma, or other cause, with the nervous system becoming involved in the course of the process. After this has taken place recovery can come only from treatment of the nervous system, treatment of the original infection alone being useless. To arrest a patho-

logic process, according to Speranskii, it is necessary to exclude temporarily some part of the nervous system; this procedure stimulating new nerve associations during the formation of which the original pathologic process is arrested. Speranskii proposed novocaine blocking of the sympathetic in the region of the waist-line as the most effective approach to the neurotropic system. The author applied novocaine blocking in the periadrenal tissue to two acute and four chronic cases of sympathetic ophthalmia. Six complete case histories show the impressive effect of the treatment in the two acute cases. Such rapid and complete recovery could not be obtained with any other type of treatment. There was some improvement in the chronic cases, but permanent ocular changes with severe disturbance of function precluded any considerable improvement.

Ray K. Daily.

8. GLAUCOMA AND OCULAR TENSION

Beckh, Walter. A case of spontaneous glaucoma in a rabbit. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1144-1145.

Beckh, Walter. Syphilis and primary glaucoma. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1129-1134.

Cavaniglia, Alfredo. Clinical researches on the use of pilocarpin collyria of high concentration. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 801-822.

Tests were made on normal and hypertonic eyes with a six percent solution of pilocarpin hydrochloride. In eyes affected by all forms of primary glaucoma a six percent solution is well tolerated and it never provokes general toxic symptoms. The author thinks this strength may be employed advantageously in ophthalmic practice. (16 figures.)

M. Lombardo.

Joseph, Etienne. Late results of operations for glaucoma. *Ann. d'Ocul.*, 1935, v. 172, Oct., pp. 827-848.

Of 650 cases gathered from the various Parisian institutions, 196 were followed for from two to nine years. In acute glaucoma a better result was ob-

tained with iridectomy than with sclerecto-iridectomy. For chronic simple glaucoma the Lagrange and Elliot operations were done. Cyclodialysis and iridencleisis were seldom performed. Out of 144 cases the operative results from the standpoint of control of tension were as follows: Of 133 sclerecto-iridectomies 20 failed. Of 12 iridectomies 7 failed. Of 6 cyclodialyses 4 failed.

John C. Long.

Klauber, E. Glaucomatous cupping without glaucoma. *Ceskoslovenska Opth.*, 1935, v. 2, no. 2, pp. 93-96.

In 1926, at the age of 34 years, a man who was a great smoker complained of a shadow in front of his left eye. The vision of either eye was 6/9, and the eyes appeared in every way normal except for a hyperemia of the vessels of the optic disc. Again seen in 1934, both discs showed typical glaucomatous cupping, and vision was barely 6/9 in the right eye and 6/12 in the left. The tension never reached over 15 mm. The fields were narrowed; and scotomas spread temporally from the blind spot. The author thinks the condition may have been due to an affection of the hypophysis (of which there are no other symptoms) or to an affection of the veins in the optic nerve.

Georgiana D. Theobald.

Perera, C. A. Bilateral buphthalmos associated with nevus flammeus. *Arch. of Opth.*, 1935, v. 14, Oct., pp. 626-628.

This rare condition occurred in a white girl aged fourteen months. Vascular nevus covered most of the face, including all of the lids, scalp, and right side of the body. The corneas were enlarged and the optic discs showed moderate cupping. The intracranial calcification was thought to indicate intracranial hemangiomas. Trephining with peripheral iridectomy reduced the tension to within normal limits in each eye.

J. Hewitt Judd.

Posner, Adolph. A checking station for tonometers. *Arch. of Opth.*, 1935, v. 14, Sept., pp. 453-457.

This station was recently established at the Herman Knapp Memorial Eye Hospital. Tonometers are checked as to

standard measurements of the parts, and are compared with a master Schiötz tonometer by means of a water manometer, which is here illustrated by a drawing. (Discussion.)

J. Hewitt Judd.

Rabinovich, M. G. Amyl nitrite in the treatment of primary glaucoma. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 181.

Ten cases of acute, two of chronic inflammatory, and four of simple glaucoma were treated with inhalations of amyl nitrite. In thirteen cases the tension fell and vision rose. The author considers amyl nitrite a powerful agent for checking an acute glaucomatous attack preparatory to operative interference.

Ray K. Daily.

Rabinovich, M. G. Zirm's iridectomy. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 175.

A tabulated report of the immediate results of 54 operations.

Redslob, E., and Reiss, P. Action of pH of the medium on the state of swelling of the vitreous body. *Ann. d'Ocul.* 1935, v. 172, Oct., pp. 848-851.

The volume changes at different hydrogen-ion concentrations were determined for fresh beef vitreous. The vitreous was measured in a pycnometer and a known volume of physiologic salt solution of definite pH was added. Volume readings were made at intervals. In general there was swelling of the vitreous with decrease in pH. The volume change was reversible on placing the vitreous in physiologic salt solution.

John C. Long.

Uribe Troncoso, M. Closure of the angle of the anterior chamber in glaucoma. *Arch. of Opth.*, 1935, v. 14, Oct., pp. 557-586.

With the gonioscope the author has observed the angle of the anterior chamber during different stages of glaucoma. He reports in three series on 87 glaucomatous eyes. Study of 26 eyes with primary congestive glaucoma, 34 eyes with simple glaucoma, and six eyes with simple glaucoma with sub-acute exacerbations, leads him to con-

clude that at the beginning of an attack the angle is open but if the attack persists or relapses occur the angle may become closed. In simple glaucoma the angle was usually open, proving that peripheral synechiae are the result and not the cause of hypertension. The extent and depth of peripheral synechiae had no correspondence with size and shape of the pupil or the height of the ocular tension. The action of the iridectomy was studied. In four cases of simple glaucoma the angle was entirely open and remained open after iridectomy lowered the tension. In many cases iridectomy lowered tension and improved vision even when the angle remained totally closed. The author believes the iridectomy works (1) by providing a large aperture between the chambers, thus equalizing pressure and allowing better circulation of liquids; (2) in some cases by freeing peripheral synechiae, thereby reopening normal outlets; (3) by relieving pressure on the veins of the iris and ciliary processes, thus permitting larger absorption of aqueous. He feels that fistulizing operations should be confined to cases in which the angle is entirely closed or in which iridectomy has failed. Ten cases of simple glaucoma with open angle were studied before and after iridectomy. The angle was found entirely closed after the operation in six cases, and in two others the synechiae progressed from partial to corneal. (Drawings.)
J. Hewitt Judd.

Wilczek, Marjan. Experimental studies in rabbits on the role of the choroid in ocular tension and on retinal permeability to crystalloids, after elimination of the iris and ciliary body. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 587.

The circulation of the anterior segment of the eyeball was eliminated by circular electrocoagulation 2 mm. from the limbus. After this fluorescein injected intravenously and potassium iodide injected subcutaneously did not reach the anterior chamber. The anterior chamber became filled with a fluid emanating from the vitreous. The effect of the following was then investigated: tying and section of the venae vorti-

cosae, pressure on and section of the veins of the neck and aorta, subconjunctival injections of adrenalin and hypertonic salt solution, and section of the ocular muscles. Intravenous injection of hypertonic salt solution caused a marked fall in intraocular tension. Changes in the crystalloid osmotic structure of the blood had no influence on permeation of strychnin from the vitreous into the blood. The retina was found permeable to strychnin and fluorescein.
Ray K. Daily.

Wittels, Ludwig. Edema of the cornea and development of an intracorneal cyst following rupture of Descemet's membrane in an eye with absolute glaucoma. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 543.

A detailed description is given of the clinical and histological findings of this case. The author explains its pathogenesis by the following sequence: absolute glaucoma, degenerative keratitis, perforation of the cornea, reduction of tension, and healing with corneo-lenticular synechia; secondary rise of tension, rupture of synechia with Descemet's membrane adhering to the anterior capsule of the lens; edema of the cornea with development of a cyst in the scar. (Illustrations.)

Ray K. Daily.

9. CRYSTALLINE LENS

Anthony, Marc. The choice of an intracapsular operation by the average oculist. *Trans. Pacific Coast Ophthalm. Soc.*, 1934, 22nd annual meeting, p. 187.

The Verhoeff intracapsular technique is the operation of choice for those who do not have extensive surgical practice. In 64 cases operated on by this method, 85 percent of the lenses were removed with their capsules intact. In the remaining 15 percent the ruptured capsule was removed after the lens was expressed. Vitreous was lost in 8 percent of the cases. (Discussion.)

M. E. Marcove.

Bellavia, A., and Mirto, F. Glycemia and glycohydria in senile cataract, and glycohydria and glycophakia in experi-

mental traumatic cataract. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 823-838.

Hyperglycemia was found in only 5 out of 23 patients affected by senile cataract, so the writers do not agree that any relation exists between the two diseases. In experimental traumatic cataract in rabbits they found the amount of glucose greater in the cataractous lens than in the clear lens of the same rabbit; and they attribute this condition to decrease in glycolytic power of the cataractous lens. (Bibliography.)
M. Lombardo.

Campos, R. Clinical and histologic researches on punctate cataract. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 688-702.

In a woman of 47 years the left eye was found affected by a choroidal melanoma and both lenses showed disseminated punctiform opacities. Microscopic examination of the lens of the enucleated eye showed in the deep anterior cortex numerous fusiform or ellipsoid formations with their long axis parallel to the surface of the lens, and in size from 0.05 to 0.2 mm. Near the equator of the lens some fibers had undergone degenerative changes similar to those described in incipient subcapsular senile cataract. (Bibliography, 4 figures.)
M. Lombardo.

Lugli, L. Late traumatic rosette cataract. *Arch. of Ophth.*, 1935, v. 14, Sept., pp. 392-407.

The author reviews the literature and presents six cases which confirm Vogt's theory that the initial opacity forms in the anterior cortex and that it is traumatic in origin. The rosette cataract is stationary, but through unbalancing of the physiologic nutrition of the lens other lens fibers may become involved. (Six drawings.) J. Hewitt Judd.

O'Brien, C. S. Detachment of the choroid after cataract extraction. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 527-540.

From a study of 75 cases of choroidal detachment following uncomplicated cataract extraction it is concluded that such detachments almost invariably occur at the time of operation; the complication being due to reduction of in-

traocular pressure with subsequent congestion of the uveal vessels and rapid and exaggerated transudation of fluid from the thin-walled veins of the ciliary body and anterior choroid into the normal perichoroidal space. Large detachments were found to follow delayed closure or rupture of the operative wound. Reattachment invariably occurred, and the fields and central vision were unaffected. Treatment other than promoting closure of the wound was unnecessary. (Photomicrographs.)

J. Hewitt Judd.

10. RETINA AND VITREOUS

Biontovskaja, E. G. Retinal tuberculosis. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 78.

Extensive retinal edema and periphlebitis occurred in a woman of 23 years, with a positive Mantoux reaction.
Ray K. Daily.

Borochoyich, S. I. Therapeutic effect of retrobulbar injections of atropin in embolism of the central retinal artery. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 149.

In two cases which the author considered as of true embolism, vision was restored after such injections. In a third case of sudden blindness which the author attributed to endarteritis atropin injections were ineffectual.

Ray K. Daily.

Caocci, G. Contribution to knowledge of familial macular degeneration. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 717-735.

A son and a daughter aged eighteen and fifteen years respectively, only living children among eight born from consanguineous parents, had become affected by nyctalopia and marked reduction of vision, each at the age of eight years, while the visual fields were normal for form and colors, without central scotoma. Hereditary lues was excluded. Examination of the fundi revealed typical symmetric changes of familial degeneration of the macular and perimacular regions. (Bibliography, 2 color pictures of fundus.)

M. Lombardo.

Hesky, Mario. The origin of the pigment encountered in the choroid around latent holes and corresponding with holes in detached retina, etc. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 736-745.

From three cases of retinal detachment the writer concludes that the pigment observed on the choroid in correspondence with an opening in the retina is a vitreous pigment attracted by the denuded choroid together with the fluid of vitreous origin in the subretinal space. (Bibliography.)

M. Lombardo.

Hesky, Mario. Recovery by conservative treatment of retinal detachment upward with large tear. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 777-785.

A man of 36 years, highly myopic, showed a large detachment in the upper temporal quadrant of the right eye with a large tear in its lower part. Erect head slightly tilted to the left both in sitting position and during sleep was prescribed with the use of a pinhole disc in front of the good eye. The patient came to the clinic twice a week for re-examination. At the end of three months the retina was reattached. Rotatory movements of the eyeball must be avoided to obtain spontaneous recovery. Sitting position and erect head are indicated if the tear is located upward, in order to facilitate settling of retroretinal fluid and to allow the tear to approach the choroid. If the tear is located laterally the head is to be tilted in a direction opposite to the tear.

M. Lombardo.

Kadlicky, Roman. Further results of surgical treatment of detached retina. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 71-78.

Forty-five cases of detached retina were operated on at Czech Eye Clinic in Prague, during the twelve months ending March, 1934. Recovery was obtained in 25 cases (56 percent). The author not only closes the hole in the retina, but also builds a wall between the normal and the diseased retina by means of a series of electrocoagulating punctures. He uses a needle whose 2-mm. point is bent at right angles.

This needle is so insulated with rubber tubing that only the bent point is free. The author devised an electrode of stainless steel to prevent oxidation. He divides the results of the operations into two groups, cured and not cured. For prognosis he compares these two groups with each other from different points of view. All cases of less than one week duration were cured. There were more emmetropic and slightly myopic cases among the cured, whereas of the unsuccessful the majority were greatly myopic. The age of the patient had no influence on the result of the operation. Single tears were more frequent in the cured cases, multiple tears more frequent in others. The tears were found mostly in the temporal half, and were of equal frequency in the upper and lower quadrants. Exceptionally they were found in the lower nasal quadrant, never in the upper nasal. The width of the detachment is of great importance for prognosis. In complete detachment the prognosis is poorer than in partial, without consideration of duration. In some cases detachment was complete within two weeks, in some a partial detachment continued for seven months.

Georgiana D. Theobald.

Knobloch, Rudolf. Filtration of subretinal fluid after electrocoagulation puncture of the sclera. *Ceskoslovenska Ofth.* 1935, v. 2, no. 2, pp. 79-86.

Detachment of the retina with tears was produced experimentally in rabbit eyes. The puncture was made with electrodes devised by the author. For the filtration experiment, physiologic salt solution with methylen blue was injected under pressure which could be measured accurately. The author watched cases up to 37 days at intervals of 6 hours, and observed that: (1) the filtrability of the electrocoagulating punctures, under physiologic pressure, did not last longer than three days, while after trephining (1.5 mm.) the filtration could be demonstrated even four weeks later. (2) Filtration from electrocoagulating punctures under physiologic pressure could be demonstrated 6, 48, and 72 hours after coagu-

lation, while after 24 and 96 hours filtration was possible only under high pressure (nonphysiologic). This is explained by primary closure of the canal during the first 24 hours being followed by opening of the canal during the next 24 hours as a result of a diminished swelling of the edges. Ninety-six hours after coagulation the opening appeared to be partially closed by connective tissue. (3) Extrusion of necrotic scleral tissue could not be found in any case. (4) If the single discs of the coagulated sclera are contiguous rupture of the sclera may be produced which, in turn, may cause a prolonged continuous filtration. In cases in which the small discs are separated from each other a minimal distance of 1 mm., no rupture of the sclera will arise. (5) If the coagulation discs encircle an area of sclera, sloughing may occur, and this may result in long continued filtration similar to that of trephining.

Georgiana D. Theobald.

Kravitz, D., and Lloyd, R. I. Dilated and tortuous retinal vessels. Report of a case of congenital arteriovenous communication. *Arch. of Ophth.*, 1935, v. 14, Oct., pp. 591-598.

A woman aged 32 years, without ocular symptoms, was found to have in the right eye retinal arteries and veins five or six times the average size. At the lower periphery a definite arteriovenous communication was discovered. The vision was 20/20 and the fields normal. The condition was thought to be congenital. Angiomatosis retinae (Hippel's disease) and Lindau's disease, as well as other types of short circuit in retinal vessels, are discussed. (Bibliography.)

J. Hewitt Judd.

Parchamenko, M. E. Ocular changes in thrombopenia. *Sovietskii Viestnik Ophth.*, 1935, v. 7, pt. 2, p. 244.

In a man, aged 25 years, a left retinal hemorrhage was the first symptom. The diagnosis was made from blood study and capillaroscopy. After x-ray therapy of the spleen the hemorrhages were absorbed and vision was restored to normal.

Ray K. Daily.

Pascheff, C. The true conception of operative cure of retinal detachment; the sealing of the tear or drainage and provoked adhesions. *Arch. d'Ophth.*, 1935, v. 52, Oct., p. 717.

The author believes that retinal tears are secondary to detachment, differing thus from Gonin, Vogt, and others. Nature cures the detachment by absorption of the subretinal fluid and cicatrization. Therefore surgery should follow the same concept. The author's technique is to denude the sclera over the affected area, without bothering about the tear. Then he does a double trephining down to the choroid corresponding to the greatest area of detachment and on two sides of the rectus muscle. The choroid is then punctured with the diathermic needle and electrocoagulated to provoke adhesions. Two fistulas are thus created, separated from each other by the corresponding rectus muscle, which by its contraction helps adhesion of the two membranes. The conjunctiva is then sutured. Two cases of successful outcome are reported. It is pointed out that for a successful result the detachment must be very recent. (Illustration, bibliography.)

Derrick Vail.

Savin, L. H. Atypical retinitis pigmentosa associated with obesity, polydactyly, hypogenitalism, and mental retardation (the Laurence-Moon-Biedl syndrome). *Brit. Jour. Ophth.*, 1935, v. 19, Nov., p. 597.

Night blindness was first complained of at nine years and was first observed at seventeen years. A family tree of three generations is illustrated. All members were healthy and held good positions except three members of the third generation, one sister and two boys, who were affected. One boy and one girl died young: both showed supernumerary fingers and toes. The remaining boy is the subject of this contribution. An illustration of the patient, two photomicrographs, and a diagram of the family tree accompany the paper.

D. F. Harbridge.

Sharkovskii, I. A., and Martinov, V. F. A rare form of retinal hemorrhage in

malaria. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 76.

A patient aged 23 years had quotidian malaria with retinal hemorrhage, metrorrhagia, purpura and ecchymosis, greatly prolonged clotting time, and a shortened blood-sedimentation time.

Ray K. Daily.

Slavik, B. Treatment of detached retina. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 65-71.

During one year, 25 cases of detached retina were operated on. Seven cases (28 percent) were successful; five of these had peripheral tears; two were without tears. Lindner's method was used in two cases without success. The Guist-Lindner method, used in nine cases, was successful in three. Diathermy punctures and Safar's electrodes were used on other cases. The hope of a successful operation is based on: (1) discovery of the tear and its exact location; (2) recent detachment; (3) small region of detachment.

Hope is lessened by: (1) conditions which render difficult localization of the tear (opacity in cornea, lens, or vitreous); (2) absence of tear; (3) complete detachment and long duration (funnel-shaped detachment; formation of connective tissue in retina and vitreous); (4) serious complications following accidents and illness, as opacity of the vitreous, complicated cataract, and great hypotension.

Georgiana D. Theobald.

Strampelli, B. Diathermic diaphanoscopy. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 665-668.

If a tear of a detached retina is seen with the ophthalmoscope, it is possible to locate the same tear on looking through the dilated pupil if a transilluminator is applied at the corresponding part of the sclera. The writer describes his modification of Lange's scleral lamp so that it may act as a diathermic electrode by means of a small cup perforated at its center and connected with the illuminating end. With this instrument diascleral coagulation is obtained at the site of the retinal tear. (One figure.)

M. Lombardo.

Takats, G. de, and Gifford, S. R. Cervical sympathectomy in retinitis pigmentosa. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 441-452.

After eleven sympathectomies on six patients, not one showed increase in vision or visual fields. No progress of the disease was noticed during the period of observation, eight to eighteen months. The authors believe that the best method is excision of the superior cervical ganglion with stripping of the carotid sheath. Further studies are indicated as to the effect on dark adaptation and minimal light perception.

J. Hewitt Judd.

Whalman, H. F. Preretinal artery. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 481-482.

The case of a man aged 21 years, in whom a preretinal artery was found in each eye, is reported and is illustrated by two drawings.

J. Hewitt Judd.

Wilczek, Marjan. Experimental studies in rabbits on the role of the choroid in ocular tension and on retinal permeability to crystalloids, after elimination of the iris and ciliary body. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 587. (See Section 8, Glaucoma and ocular tension.)

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Avgushevich, P. L. Ocular complications in the treatment of malaria with plasmocide. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 71.

One case of optic neuritis and two of optic atrophy were caused by excessive doses of plasmocide.

Ray K. Daily.

Carroll, F. D. Analysis of fifty-five cases of tobacco-alcohol amblyopia. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 421-434.

The findings are summarized as to incidence, symptomatology, pathology, etiology, treatment, and prognosis. The great variability in the normal course of the disease renders proper evaluation of any treatment difficult, but the relation of abstinence to improvement was usually striking. Cases are cited, however,

in which patients improved without markedly decreasing the amount of tobacco and alcohol used. (Ten tables.)

J. Hewitt Judd.

Kosmin, V. I. Optic atrophy caused by plasmocide, and its treatment with retrobulbar injections of atropin. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 73.

The author reports six cases of toxic amblyopia caused by plasmocide. Five were treated by retrobulbar injections of 0.1 percent atropin, with a permanent improvement of visual acuity in all cases, and enlargement of the form field in four.

Ray K. Daily.

12. VISUAL TRACTS AND CENTERS

Dvorjetz, M. A. Epidemic encephalitis and the organ of vision. *Ann. d'Ocul.*, 1935, v. 172, Oct., pp. 852-854.

380 cases of epidemic encephalitis were studied in reference to neurologic eye lesions, thirteen to fourteen years after the acute illness. In 5.6 percent of the cases the eyes were normal. The nuclei of the external ocular muscles were involved most frequently, and multiple ocular palsies were commoner than single lesions. Disturbances of associated movements were demonstrated in 44.6 percent. Unocular diplopia was seen occasionally. Lesions of the optic nerves and visual pathways were found. There seemed to be no correlation between the severity of the acute illness and the presence of postencephalitic ocular changes. These cases demonstrate that the convergence center is located in the nuclei of the third nerve.

John C. Long.

Globus, J. H., and Silverstone, S. M. Diagnostic value of defects in the visual fields and other ocular disturbances, associated with supratentorial tumors of the brain. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 325-386.

A clinical and anatomic survey of 171 verified supratentorial brain tumors revealed that only in a very small percentage of cases were perimetry and ophthalmoscopy of aid in localization or in determining the type of growth. The tumors are classified into twenty

groups, and the findings in each are shown by perimetric charts and tables. The findings are again considered as to papilledema, optic atrophy, visual acuity, scotomas, pupillary manifestations, and disturbances of the intrinsic and extrinsic muscles. Characteristic field defects, when obtained, are of immense diagnostic service. Atypical findings may result from indirect pressure or from selective infiltration of the tumor. A Kennedy syndrome was found only once in forty cases with frontal and prefrontal tumors. (Drawings, photographs.)

J. Hewitt Judd.

13. EYEBALLS AND ORBIT

Brunton, C. E. Studies in exophthalmos. *Jour. of Physiology*, 1935, v. 84, June 18, p. 334.

The amount of proptosis was studied by the author in dogs and cats by injecting ephed-hydrochloride and epin-in intravenously. The degree of protrusion of the globe and of retraction of the lids was studied by means of an instrument placed on the cornea between the lids, and readings were made on a smoked drum. In most cases there was retraction of the nictitating membrane and of the eyelids, with slight dilatation of the pupil. The author considered a protrusion of 2.25 mm. as representing true proptosis. This occurred in only one of 36 cases. The exophthalmos persisted after the blood pressure had returned to normal.

M. E. Marcove.

Code, C. F., and Essex, H. E. The mechanism of experimental exophthalmos. *Amer. Jour. Opht.*, 1935, v. 18, Dec., pp. 1123-1128.

Hale, Fred. The relation of vitamin A to anophthalmos in pigs. *Amer. Jour. Opht.*, 1935, v. 18, Dec., pp. 1087-1092.

Lubimov, A. A. Ocular involvement in gangrene. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 126.

A woman 21 years of age had an extensive cicatrix of the face involving the lids, and a bony defect of the lower orbital margin, all caused by a necrotic process at the age of seven years. Fur-

ther examination showed that the process had destroyed the inner structures of the nose and also the soft and hard palate. It was attributed to external infection and defective nutrition. (Illustrations.) Ray K. Daily.

Wagner, R. Orbital abscess following extraction of tooth. *Ceskoslovenska Opth.*, 1935, v. 2, no. 2, pp. 117-119.

Two days after extraction of an abscessed left molar tooth, a twelve-year-old boy developed an orbital abscess on the same side, with general fever. After treatment with diathermy and milk injections, the abscess was opened and the orbit returned to normal in a short time. *Streptococci* were found in the pus. Georgiana D. Theobald.

Wieczorek, Anton. The bony structure of the orbit. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 538.

The author continues his study on the relation of the shape of the nose to the osseous structure of the orbit. The inner orbital walls are more convergent in skulls with flat large noses than in those with high narrow noses. Variations in the structure of the inner orbital wall serve to make the size of the orbit independent of the shape of the nose. Ray K. Daily.

Zitowskii, M. L. Orbitocranial hernias. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 249.

A meningocele in the upper inner portion of the orbit was excised and the osseous opening filled with costal cartilage. The patient, a girl of seventeen years, made an uneventful recovery and there was no recurrence.

Ray K. Daily.

14. EYELIDS AND LACRIMAL APPARATUS

Halbertsma, K. T. A. True congenital distichiasis. *Arch. d'Opht.*, 1935, v. 52, Oct., p. 738.

A 37-year-old storekeeper complained of recurrent wild eyelashes. Both eyeballs were inflamed. The margins of each lid showed a double row of cilia, the posterior ones finer, 2 or 3 mm. long, and rubbing the globe. A small piece of

the right upper lid, removed for histologic study, showed multilobular meibomian glands surrounding the hair roots. (Illustrations, bibliography.) Derrick Vail.

Jablonska, Zofja. A study of the material of the Warsaw University eye clinic relative to the pathogenesis and therapy of dacryocystitis. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 520.

On the basis of tabulated bacteriologic study of 134 cases, and 25 brief clinical histories, the author concludes that dacryocystitis is a disease of poverty, more frequent among women than men, and more frequently involving the left lacrimal sac. The relation of dacryocystitis to nasal pathology is shown by bacteriologic and clinical findings. Conservative treatment, consisting of irrigation with rivanol, optochin, lipiodol, zinc sulphate, and silver nitrate, is effective in children and in early cases, particularly in pneumococcus infections. Most chronic cases ended with excision of the lacrimal sac. The author regards dacryocystorhinostomy, with which the clinic has not had sufficient experience, as a technically difficult procedure. Ray K. Daily.

James, W. M. The lysozyme content of tears. *Amer. Jour. Opth.*, 1935, v. 18, Dec., pp. 1109-1113.

Lyzinskii, G. F. Comparative evaluation of plastic marginal operations. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 137.

The objections to transplantation of skin into the intermarginal space are: the presence of fine hairs which may be as irritating as in trichiasis; xerosis and maceration of the transplant; and unsatisfactory cosmetic appearance. Transplantation of mucous membrane of the lip into the intermarginal space is very effective for trichiasis and entropion, and is satisfactory cosmetically. Its disagreeable feature is the pain in the lip during healing. Transplantation of auricular cartilage into the intermarginal space is technically simple and cosmetically satisfactory, but the primary result is not perma-

nent because the implant shrinks rapidly, and hence the trichiasis recurs.

Ray K. Daily.

Marucci, Luigi. A palpebral pseudo-horn. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 852-868.

A boy of thirteen years showed in the middle of the right lower lid a neoformation that clinically had the aspect of a horn. Histologically, however, it proved to be formed of a cortical epithelial section, which at its base continued the normal epithelium of the lid; and a medullary section formed by an inflammatory infiltration that reached to the tarsus, taking the aspect of a typical granuloma containing meibomian gland. The neoformation had originated from a chalazion which had opened through the skin. (Bibliography, 6 figures.)

M. Lombardo.

Panico, E. Biomicroscopy of the orifices of the ducts of the lacrimal gland. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 768-773.

These orifices are situated along a line concave toward the cornea. They are surrounded by conjunctival epithelium which here has a pearly-gray color. In chronic pathologic conditions of the conjunctiva they may be distorted or vary in size. (Bibliography, 6 figures.)

M. Lombardo.

Riser, R. O. Dacryostenosis in children. *Amer. Jour. Opth.*, 1935, v. 18, Dec., pp. 1116-1122.

Szymanski, J. Sapiiranga. *Klinika Oczna*, 1935, v. 13, pt. 3, p. 581.

Sapiiranga is a chronic, bilateral, ulcerative destructive blepharitis, endemic in Brazil. It is probably of mycotic origin, with the principal focus of infection in the meibomian glands. Potassium iodide is a specific remedy for the disease. (Illustrations.)

Ray K. Daily.

15. TUMORS

Bucalossi, Antonio. Sarcoma of the optic disc. *Ann. di Ottal.*, 1935, v. 63, Sept., p. 676.

The author observed a case of pigmented sarcoma of the optic disc propagated from the choroid and extending through a small perforation of the lamina cribrosa a short distance into the optic nerve. The origin of the neoplasm was shown clinically and histologically by pigment cells on the lamina cribrosa.

Park Lewis.

Colombo, Giuseppe. Melanotic sarcoma of the choroid with nonpigmented palpebral metastasis in a girl of three years. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 839-851.

Histologic examination of the enucleated eye showed an abundantly pigmented mass developed from the entire choroid. Four months later a nonpigmented sarcoma was removed from the upper lid. (Bibliography, 6 figures.)

M. Lombardo.

Filippi-Gabardi, E. Xeroderma pigmentosum with ocular lesions. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 703-716.

A young man of seventeen years who had been affected by xeroderma pigmentosum after an attack of measles at the age of four years, had also shown since the age of eight years a neoformation of the size of a pea on the conjunctiva of the right eye. During the last two months this growth had shown rapid development, covering as a reddish hard mass the anterior segment of the eye and protruding out of the palpebral aperture. It had developed itself at the expense of the cornea, and extended down to Descemet's membrane. Histologically it appeared to be an epithelioma with spindle, oval, and round cells. (Bibliography, 11 figures.)

M. Lombardo.

Kahoun, Svatopluk. Metastatic carcinoma in the eye and optic nerve. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 107-111.

Eight years after removal of a breast for carcinoma, a 55-year-old female developed metastasis in the right eye. She presented herself at the hospital with what appeared like a simple detachment of the retina. After a Guist operation,

tension increased. The eye was enucleated on account of pain. Histologic examination showed infiltration of retina, optic nerve, and choroid with cancer cells. Georgiana D. Theobald.

Kurz, Jarmomir. Unusual course of sarcoma of the choroid. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 103-106.

In June, 1931, a 35-year-old man, with pulmonary tuberculosis, complained of poor vision in the right eye. To the temporal side of the macula was seen a discrete chorioretinal lesion, which was attributed to tuberculosis. A year and a half later, the lesion appeared the same, except for a very small detachment anterior to it. February, 1932, the man had a pulmonary hemorrhage. He was then at another clinic, where the fundus lesion was diagnosed as "a fresh tuberculous central chorioretinitis." In September, 1933, the fundus picture was entirely changed, the retina was detached, its vessels dilated and tortuous, and several hemorrhages visible. Histologic examination showed two separate mixed-cell (spindle, round, and pigment) tumors. The author considered one metastatic to the other. Georgiana D. Theobald.

Mossa, G. Reticuloma of the orbit. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 869-886.

A man of 32 years had had intense pain in the left orbital and frontal regions for two months. The corresponding eye had been progressively protruding and its visual power rapidly decreasing for three weeks. There was papilledema with enlarged retinal veins. X-ray examination revealed a shadow in the orbital region. The orbit was exenterated and a vascular neoplastic mass adherent to the bone was removed. From its histology the author classifies the tumor as a reticuloma. (Bibliography, 2 figures.)

M. Lombardo.

Orr, H. C., and Johnston, I. L. Thyroid carcinoma with metastasis in the ciliary body. *Brit. Jour. Ophth.*, 1935, v. 19, Nov., p. 593.

A carcinoma occupied the outer two-

thirds of the ciliary body. A small lump had been present in the thyroid gland for eight years. Comparative microscopic study of sections from the eye and thyroid mass showed similarity of cells. The authors were unable to find in the literature a case of carcinoma of the ciliary body secondary to such a growth of the thyroid. (3 photomicrographs.) D. F. Harbridge.

Orzalesi, F. A case of primary glioma of the iris. *Boll. d'Ocul.*, 1935, v. 14, May, pp. 641-664.

A girl of twelve years showed a pinkish, irregularly triangular neof ormation in the lower temporal quadrant of the left iris. Its apex protruded into the pupillary area and its anterior surface was in contact with the posterior surface of the cornea. The tension of the eye was normal. The tumor was removed through a sclerocorneal incision. Eight months later, under X-ray treatment, the eye did not show relapse, while vision remained 5/10. Histologically the tumor was a glioma. (Bibliography, 10 figures.)

M. Lombardo.

16. INJURIES

Anelli, Dante. A case of pneumophthalmos. *Boll. d'Ocul.*, 1935, v. 14, June, pp. 774-776.

Soon after being struck on the right eye by a piece of stone a middle-aged working man noticed black spots in front of this eye. There was a linear wound 1 mm. long in the lower outer quadrant of the cornea; and through a corresponding defect in the iris the anterior lens capsule was seen to be torn and the lens matter opaque. Ophthalmoscopic examination showed intraocular hemorrhage below, a wound in the macular region, and three air bubbles in the upper part of the fundus. X ray did not reveal an intraocular foreign body. (Bibliography, 2 figures.)

M. Lombardo.

Bickerton, R. E. New cases of war blindness due to mustard gas. *Brit. Med. Jour.*, 1934, v. 2, Oct. 27, p. 769.

The author reports seven cases gassed during the World War and still

suffering intensely with progressive loss of already much impaired vision. The conjunctivas, especially of the lower fornices, are as irritable and inflamed today as they were after the acute effects had worn off. Initial severe edema of conjunctiva and lids has now given place to chronic conjunctivitis with total destruction of the mucin-secreting glands, resulting in shrinking of the conjunctiva and xerophthalmia. Corneal destruction with ulceration and bulging of the thinned cornea is the later effect which brings the patients into hospital many years after the war.

M. E. Marcove.

Bursuk, G. G. Removal of foreign bodies from the posterior corneal layers. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 154.

To prevent escape of a foreign body from the posterior corneal layers into the anterior chamber, during an attempt at removal, the author has devised a knife which is introduced into the anterior chamber and fixes the foreign body from behind. (Illustrations.)

Ray K. Daily.

Davidson, H. P. Hardened ophthalmic lenses. *Arch. of Opht.*, 1935, v. 14, Sept., pp. 484-489.

The author reviews the progress made in protective lenses and presents in detail the government specifications for hardened or "heat-treated" lenses. Laminated lenses are a more recent invention, and often protect without additional weight and thickness.

J. Hewitt Judd.

Gekker, P. I. Ocular traumatism in metal workers in the Amur and lower Dnieper region. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 95.

Isolation of the industrial section favors the concentration of all traumatic cases in the factory hospital. Beginning in 1931 accurate data were kept on ocular traumatisms, which formed 14 to 16.5 percent of all injuries. The majority were cases of corneal foreign body. Most of the injured were between 20 and 30 years of age, some between 30 and 45, and a few over 50

years. This is explained by the greater skill of older workers and the protection of presbyopic glasses. The prophylactic work is directed towards education, individual protection, and safety devices on machines. The author is convinced that corrective spectacles are superior to goggles, and he recommends establishment of an optical department in each factory.

Ray K. Daily.

Langhammerova, Rozalie. Perforating injury of the eyeball with fragment of spectacle lens. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, pp. 119-122.

Among 88,854 dispensary patients wearing glasses, only two suffered injury from breakage of the lens. Both cases had perforation of the cornea with iris prolapse. In spite of very frequent lens breakage, there is seldom injury of the eye. The author's statistics show one in 44,427 cases. Lauber reported one in 30,000.

Georgiana D. Theobald.

Melanowski, W. H. The eye and radiant energy. *Klinika Oczna*, 1935, v. 13, p. 492. (See Section 2, Therapeutics and operations.)

Natanson, D. M., Peisachovich, I. M., and Vinogorov, D. P. The effect of arc light on the eye in electric welding. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 220.

In experimental study on rabbits, the pathologic changes depended on the distance from the light and the length of exposure. At 50 cm. an exposure of from 10 to 30-seconds produced only transitory hyperemia of the conjunctiva. An exposure of one minute produces edema of the lids and diffuse corneal opacities of several days duration. At 50 cm. an exposure beyond one minute produces permanent anatomic changes in the anterior segment of the eyeball as well as retinal lesions of an exudative and degenerative character. Repeated exposures at 50 cm. do not produce a cumulative effect or develop immunity. Reflected arc light has no effect on the eye even in exposures of one hour. Preliminary instillation of water or carodemin does not diminish

the effect of the exposure. Window glass protects the anterior segment of the eyeball, but does not prevent changes in the retina.

Ray K. Daily.

Ostroumov, V. M. Ocular injuries in the electrical industry by particles of copper wire. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 169.

Brief reports of seven cases lead to the following conclusions: Thin copper particles are well tolerated by the cornea. Penetration into the anterior chamber or deeper leads to severe recurrent ocular irritation and loss of the eye. Copper causes development of reddish-yellow or reddish-white nodules, which may be confounded with tuberculosis or syphilis. The particles may wander through the eyeball, and may escape through the cornea spontaneously. The presence of a fine copper splinter in the anterior chamber may cause marked permanent reduction in visual acuity, without visible fundus changes. Knapp's needle is very satisfactory for removal of such particles. Vogt's skeleton-free roentgenographs are valuable diagnostically. (Illustrations.)

Ray K. Daily.

Rabinovicz, M. G., and Kulieva, M. X. Ocular injuries in children. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 188.

From detailed analysis of 194 injuries, relative to age, sex, type of injury, and final result, the conclusions are that 75 percent of such injuries (in which 21 percent of the eyes are functionally lost) are due to carelessness. They can be combated only by prophylaxis, which should consist in education of parents as to the menace from children's favorite toys and in prohibiting their sale.

Ray K. Daily.

Sabata. Iritis caused by subconjunctival bullet. *Ceskoslovenska Ofth.*, 1935, v. 2, no. 2, p. 122-123.

In August, 1933, a 33-year-old patient presented himself at the clinic with iritis of the right eye. In 1914 he suffered a gunshot wound of the face. His eyes were sore at that time, but vision returned to normal. The present complaint was of one-week duration. The iritis disappeared after removal of the bullet, which was under the bulbar conjunctiva, 5 mm. from the 6-o'clock position. Georgiana D. Theobald.

Tichvinskii, B. I. Ocular protection in mountain climbing. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 1, p. 107.

The eyes should be protected not only from direct sunlight but also from light reflected from sky and snow. Tinted lenses should not impair visual acuity. Most popular were smoked greenish-yellow glasses transmitting 20 percent and 6 percent of visible light. Green glasses transmitting 2 percent of visible light interfered with walking by reducing visual acuity and changing the coloring of the surroundings. Those transmitting 36 percent were too light and uncomfortable. Ray K. Daily.

Tomilova, A. F. The effect of electric welding on the organism of the worker. *Sovietskii Viestnik Opht.*, 1935, v. 7, pt. 2, p. 253.

The Russian code of labor classes electric welding as a harmful occupation, assigning it the short six-hour day and ordering milk for the employees. The writer proves that the only harmful feature of the work, ocular inflammation, is wholly preventable, and that the ultraviolet rays and the ion content of the air stimulate the constitutional resistance of the workers, so that their disease incidence is the lowest in the occupational scale. Ray K. Daily.

NEWS ITEMS

Edited by DR. H. ROMMEL HILDETH
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month.

Deaths

Dr. W. Adams Frost, London, died October 25, 1935, aged 80 years.

Dr. W. N. Souther, Portsmouth, N.H., died November 24, 1935, aged 74 years.

Dr. Emmett P. North, St. Louis, died December 28, 1935, aged 57 years.

Dr. Hugo Albert Kiefer, Los Angeles, died October 26, 1935, aged 65 years.

Dr. Thomas Herbert Bell, Winnipeg, Manitoba, Canada, aged 63 years, died November 28, 1935, of cerebral embolism.

Dr. James Joseph King, New York, died November 29, 1935, aged 53 years.

Miscellaneous

The Medical School of Washington University, Saint Louis, offers a week's intensive training in ophthalmology and otolaryngology. Only qualified ophthalmologists and otolaryngologists will be accepted for this course, which begins on Monday, March 2d and terminates on the evening of Saturday, March 7th. For information address the Dean, School of Medicine, Washington University, Saint Louis, Missouri.

A week of intensive postgraduate work in ophthalmology and otolaryngology will be given in March, 1936, at Portland, Oregon, under the combined auspices of the Oregon Academy of Ophthalmology and Otolaryngology and the University of Oregon Medical School. A course in ocular pathology supervised by Dr. John E. Weeks and Dr. Frank R. Menne, Professor of Pathology of the University of Oregon Medical School will be offered. Dr. Olof Larzell, Professor of Anatomy will conduct a course in dissection of the head and neck. Lectures and operative clinics will be presented by Dr. Harry S. Gradle of Chicago, Dr. William L. Benedict of Rochester, Minnesota, Dr. William P. Wherry of Omaha, and Dr. Dean Lierle, of Iowa City. Physicians of the Northwest who are interested may obtain further information by addressing Dr. A. B. Dykman, Medical Dental Building, Portland, Oregon.

An Eye Institute, held recently in Rochester, N.Y., is the fourth which has been organized in this state by the Bureau for Prevention of Blindness of the State Department of Social Welfare, Division for the Blind. Medical Societies, Health and Social Agencies, have jointly taken part in the organization of these meetings. The purpose of these Institutes is to make available to lay workers in the field (public health

nurses, social workers and teachers) a general knowledge of the eye, its normal anatomy and physiology, and its relation to the body as a whole. Programs include talks on nutrition, errors of refraction, ocular-muscle defects, and accident hazard and other topics. Pathological sources of eye conditions as related to constitutional diseases are discussed from the standpoint of prevention. In the development of this statewide educational project, enthusiastic co-operation had been received from ophthalmologists who have presented papers on selected phases of eye work, in terms readily understood by lay workers.

The first Eye Institute was held in New York City in 1931, in coöperation with the Southeastern District of Health Teachers and School Nurses. This organized group which represents thirteen counties felt the need for a broader knowledge of eye conditions in relation to their own field activities. A second Institute was held in Buffalo in 1933, at the request of the Western Zone of Health Teachers and School Nurses. Several counties in this territory were represented and a similar program was given. One hundred and ten workers from various organizations were registered. Although about three hundred workers attended the New York City Institute, it was rightly predicted that a smaller number should be expected outside of Greater New York.

In the following year, 1934, the Eye Institute was being initiated in Syracuse when the Onondaga County Medical Society and the Eye, Ear, Nose and Throat Club of Syracuse asked that the Institute be held jointly with them at the time of their annual meeting. This interest on the part of organized medicine marked a step in advance in the educational program of the state. At the evening session, Dr. Harry Gradle, who was the guest speaker for the Medical Society and the State Commission for the Blind, gave an address on the prevention of blindness.

The fourth Eye Institute which was held in Rochester, October 15th and 16th of this year, was a coöperative effort between the Monroe County Medical Society, the Monroe County Tuberculosis and Health Association, Eye Conservation Committee, and seventeen affiliated local organizations. A registration of four hundred and fifty persons manifested a recognition of the importance of this subject. The program covered the same general scope as at previous Institutes. Dr. Gradle was guest speaker for the County Medical Society. His sub-

ject was, "Prevention of Blindness." A luncheon address on "The Blind" was given by Dr. David C. Adie, Commissioner, New York State Department of Social Welfare. Dr. Adie's paper stressed the handicap of blindness and the responsibilities of society towards the blind.

At the close of each Eye Institute, Dr. William F. Snow, Director of the American Social Hygiene Association, has summarized the lectures and interpreted the significance of interrelated material. Dr. Snow stresses the value of continuity and fusion of subject matter covered by the lecturers.

The above educational program as developed in New York State is supplemented by a Course on Eye Conditions which has been offered for the past three years at New York University, sponsored by the State Commission for the Blind. The Commission has been fortunate in having the support of outstanding ophthalmologists in the development of this course. Among those who have lectured are: Dr. John Wheeler, Dr. Webb Weeks, Dr. Bernard Samuels, Dr. Conrad Berens, Dr. Robert Merriam Rogers. This course is now being held at Columbia University under a coöperative arrangement with the New York Institute for the Education of the Blind and the New York State Commission for the Blind.

On November 21, 1935, Dr. John N. Evans was appointed Ophthalmologist in Chief to the Division of Ophthalmology at the Long Island College Hospital. This institution is now requiring the certificate of the American Board of Ophthalmology as a prerequisite for advancement beyond the grade of Clinical Assistant. Drs. Milton Bergmann, Herman Weiss, Louis Freimark and David Waugh have been appointed to the Staff of the Long Island College Hospital.

Societies

On December 5, 6, and 7, 1935, the National Society for the Prevention of Blindness held its annual conference in New York City. The following facts are listed to give some idea of the extensive activities of the Society. The film "Preventing blindness and saving sight" was seen by 3100 people at 360 showings; 1113 new articles and editorials appeared, resulting from the Society's press releases; 101 sight-conservation exhibits were provided; 83 teachers were trained in sight-saving class methods during Summer Sessions; 46 cities in 23 states and three foreign countries were visited with representatives; 14 different communities were helped in incorporating prevention of blindness in their programs; thousands of workers and employers received information on sight conservation and prevention of eye accidents in industry.

The first topic, "Medical Social Work in the Prevention of Blindness," was discussed in joint session with the North Atlantic District of the American Association of Medical Social Workers and with the Committee on

the Development of Medical Social Service in Eye Hospitals and Clinics of the Welfare Council, with Miss Antoinette Cannon presiding in the morning of the first day and Dr. Ellice M. Alger, Professor of Ophthalmology, New York Postgraduate Medical School, presiding in the afternoon. Ralph G. Hurlin, Ph.D., Chairman, Committee on Statistics of the Blind, presented "Some recommended standard records for use in care of the blind and prevention of blindness." Dorothea Gilbert, Case Consultant, Social Service Department, Hospital of the University of Pennsylvania, Philadelphia, spoke on "Hospital records as a source of medical research" and Grace Cooke, Medical Social Eye Worker, St. Luke's Hospital, New York, presented "Advantage to the patient of a united participation in medical social case work." Dr. Mark J. Schoenberg, Attending Surgeon of Knapp Memorial Eye Hospital, New York, gave a paper on "Could we save more sight for glaucoma patients by continuous follow-up and care?" "Facts from seven years' experience of a social service follow-up and care of glaucoma patients" by Amy G. Smith, Chief Worker, Medical Social Service, Massachusetts Eye and Ear Infirmary, completed the discussion on glaucoma.

On the morning of the second day Lewis H. Carris, Managing Director, National Society for the Prevention of Blindness, presided, the subject being "Prevention of blindness responsibilities of official and volunteer agencies." The speakers were: Agnes K. Hanna, Director, Social Service Division, Children's Bureau, United States Department of Labor; Dr. B. Franklin Royer, Consultant, Committee on Conservation of Vision, State and Provincial Health Authorities of North America; Mrs. Mary E. Ryder, Executive Secretary, Missouri Commission for the Blind; H. R. Latimer, Executive Secretary, Pennsylvania Association for the Blind.

"The problem of fireworks accidents" was the topic for the afternoon, with Arthur Williams, President, American Museum of Safety, presiding. This meeting was in joint session with the American Museum of Safety. Louis Resnick, Director of Industrial Relations, National Society for the Prevention of Blindness, gave an address based on a report from the study of fireworks accidents in 1935 by Dr. Leland E. Cofer, Director, American Museum of Safety. The common firecracker was the chief offender in a total of 7738 accidents in this country. The funds for this study were furnished by the Pyrotechnic Industries Inc., and Mr. C. H. Fleming, Executive Secretary of this organization pointed out that the reputable fireworks manufacturers were in sympathy with the movement. He said that the industry wanted to stop making dangerous fireworks but this was useless as long as they would be replaced by far more vicious fireworks offered by unscrupulous manufacturers. In addition, he indicated the advantages of the Canadian

form the regulation which was national in extent. Dr. C. H. Watson, President, National Safety Council, urged the early care of eye injuries by ophthalmologists. John Williams Avirett, 2d, of Baltimore, President of the Maryland Society for the Prevention of Blindness, said that in Baltimore City with a population of 800,000 people there were only 12 fireworks casualties in 1931, none in 1932, 10 in 1933, 11 in 1934 and 16 in 1935. In his paper "Can we reduce fireworks' casualties through legislation?" he indicated that adequate legislation would control the number of accidents but something more than city laws was necessary. State regulation with power over the fireworks manufacturers would probably be most effective.

A "Greeting" by Helen Keller, Vice-President, National Society for the Prevention of Blindness, and "Scientific advance and welfare programs in sight saving" by Alphonse M. Schwitalla, S.J., Dean, St. Louis University School of Medicine, and "Looking forward" by Mrs. Winifred Hathaway, Associate Director, National Society for the Prevention of Blindness, completed the afternoon of December 6th.

"The influence of the Public Health Nurse in preventing blindness and conserving vision" was the final topic. This was discussed in joint session with the National Organization for Public Health Nursing, Dorothy Deming, General Director, presiding. Pearl McIver, R.N., Public Health Nursing Analyst, United States Public Health Service and Martha M. Eliot, M.D., Assistant Chief, Children's Bureau, United States Department of Labor, spoke on "The social security act as it will affect public health nursing."

"Recent advances in medicine and surgery for the prevention of blindness and the conservation and restoration of sight" was presented by Dr. LeGrand Hardy, Director of Eye Service, Fifth Avenue Hospital, New York. The conference was concluded by a discussion on "How public health nursing can carry out a program of prevention of blindness." The speakers were: Marie Swanson, R.N., Supervisor of School Nurses, The University of the State of New York, State Education Department, Albany; Amelia Grant, R.N., Director, Bureau of Public Health Nursing, New York; Gertrude H. Bowling, R.N., Executive Director, Instructive Visiting Nurse Society, Washington, D.C.

On December 19, 1935, Professor Alfred Bielschowsky presented a paper on "Functional disturbances of the eyes, including aniseikonia," at the meeting of the Brooklyn Ophthalmological Society.

The Philadelphia County Medical Society held the following program on January 2, 1936: Dr. Samuel Phillips, Case of blindness following toxemia and nephritis of pregnancy; Dr. Mortimer W. Blair, Traumatic iridodialysis, presentation of two cases, one with nonsurgical reattachment; Dr. Frank

A. Murphy, Disappearance of cataractous lens following an attack of iritis; Dr. Charles W. Lefever, Retinitis pigmentosa with special reference to sympathectomy as a means of treatment.

The next meeting of the Southern Medical Association will be held in Baltimore. At the recent St. Louis meeting the following men were elected to office for the year 1936: President, Dr. Fred M. Hodges, Richmond, Va.; First Vice-President, Dr. Quitman U. Newell, St. Louis; Chairman of the section Ophthalmology and Otolaryngology, Dr. Millard F. Arbuckle, St. Louis; Vice-Chairman, Dr. Grady E. Clay, Atlanta, Ga.; Secretary, Dr. Oscar M. Marchman, Dallas, Texas.

Personals

Having reached the age limit, Professor Emil de Grosz is retiring from the First Ophthalmologic Clinic of Budapest, after thirty years of service. The occasion has been celebrated in a jubilee volume, prepared by his former students. Since its foundation, the Budapest Clinic has treated over 659,000 patients. Professor de Grosz also retired recently from the presidency of the International League for the Control of Trachoma, a position which he had occupied for five years. An appreciation of his work as a clinician and teacher, written by Professor Maggiore of Genoa, appears in *Annali di Ottalmologia* for September, 1935. Professor de Grosz is well known in America, where he was guest of several national societies in 1933.

The Dutch Government recently issued a commemorative postage stamp in honor of Franz Cornelius Donders, and bearing his portrait.

Dr. Jaroslav Kubik has been given the permanent appointment as head of the eye clinic of the German University in Prag, succeeding Dr. Anton Elschmig who retired on account of the age limit two years ago.

The October issue of the *Klinische Monatsblätter für Augenheilkunde* contains an obituary notice of Hermann Wilbrand of Hamburg, who died last September at the age of 84 years, after being bed ridden for several years by a number of apoplectic seizures. (For the last two years he was without the power of speech.) Wilbrand's painstaking investigations as to the visual tracts and centers are well known. After the World War he had the satisfaction of saying that the experiences of this war in injuries to the optic centers supported the earlier conclusions of himself and Henschen (who had devoted himself particularly to histologic study of the brain) that the retina was projected on the surface of the cerebral cortex around the calcarine fissure. Henschen, who writes the obituary notice, says that although Saenger signed as collaborator on the monumental "Neurology of the eye," this latter author did not actually contribute a single sentence to Wilbrand's seven volumes.

THE NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS, INC.

50 West 50th Street, New York, N.Y.

Offers films, slides, and exhibits, on loan free of charge,
except for the cost of shipping.

FILMS

Preventing Blindness and Saving Sight—2 reels, 16 or 35 mm.

Shows vision defects and their correction; eye diseases, notably trachoma, and their prevention; rules for eye health through proper illumination, eye care, and preventive measures in childhood and old age; and industrial eye protection.

Popular treatment, suitable for lay audiences and for high schools, as well as for medical groups and medical social audiences.

SLIDES

Topics are as follows:

Ophthalmia Neonatorum	Vision Charts
Trachoma	Sight-Saving Classes
Accidents	The Blind
Play Accidents	Preschool Children
Illumination	General Topics
School Children	Technical Topics

Itemized lists will be sent on any topic, so that individual selection may be made. Borrower is responsible for breakage. Stereopticon slides may be borrowed free of charge or purchased at cost—35 cents each.

EXHIBITS AND DISPLAYS

Specially prepared material is available upon request. On making request, please indicate date for which material is needed, as well as space available, and type of material required.

YEAR BOOKS . . .

There are available a limited number of Year Books for the years 1923, 1924, 1925, 1926 and 1927 at a greatly reduced price. Also complete volumes of the American Journal of Ophthalmology Series 3, one to eighteen; and single copies of the Journal from any of the above volumes.

Send all orders to

The Ophthalmic Publishing Company
640 South Kingshighway, St. Louis, Missouri

The GRÜSS *Rethreadable* NEEDLE

SECURELY HOLDS A SINGLE SUTURE

PRECISION-MADE

Hand finished finest surgical steel, scientifically hardened and tempered by an exclusive process.

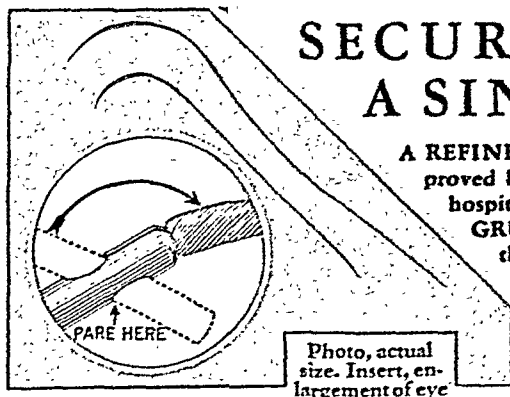
A REFINEMENT IN SURGICAL SUTURING. Perfection proved by two years' use in leading American and European hospitals. Ordered and re-ordered by world-famed surgeons.

GRÜSS Needles, fully patented, are the only instruments of their kind. Reduce trauma to a minimum. Rethreadable; can be used indefinitely . . . Types and sizes for all uses, all sutures.

FOR FURTHER INFORMATION, WRITE

GRÜSS SURGICAL MFG. CO.

163 SECOND STREET, SAN FRANCISCO, CALIFORNIA



ARTIFICIAL HUMAN EYES TRUE TO LIFE

*Fitted and Made to Order by Skilled Artisans
Referred Cases Carefully Attended*

Best quality
blended iris eyes
fitted by Experts
from one of the
largest and com-
plete stocks.



Gold and Glass
spheres carried
in stock.

Our Experts
make regular
visits to all prin-
cipal cities.

Fitted with Reform Eye, shortly after operation
Remarkable motion, no noticeable depression

Selections on Approval for Ophthalmologists who do their own fitting.

LIFELIKE ARTIFICIAL EYES properly fitted and especially made to order by our highly skilled and experienced Artisans who have spent a life-time at their Art. They have served for many years, the leading Oculists, Ophthalmologists and their Patients, who have proven themselves, conclusively that *here* they are assured the correct fitting, comfortable, perfectly matched eyes, so desired and admired by particular people.

FRIED & KOHLER, INC.

"Specialists in Artificial Human Eyes Exclusively"

665 Fifth Avenue near 53rd St.

New York, N.Y.

Telephone Eldorado 5-1970

"For almost forty years devoted to pleasing particular people"

AMERICAN JOURNAL OF OPHTHALMOLOGY

PRESCRIPTION OPTICIANS

BOSTON, MASS.

Bartlett & Son Company
346 Boylston Street
Specialists in the making of Eyeglasses
and Spectacles from Oculists' prescriptions.

BROOKLYN, N.Y.

J. H. Penny, Inc.
144 Joralemon St.
Medical Arts Building

BUFFALO, N. Y.

Buffalo Optical Company
559 Main Street
Peter Meyer, Oscar Cleal, Herbert Derrick
—Established 35 Years—
Member Guild of Prescription Opticians
of America

CHICAGO, ILL.

Almer Coe & Company, Opticians
105 N. Wabash Ave., (Three other Stores)
Bausch & Lomb Ophth. Instruments
Carl Zeiss (Jena) Microscopes
Carl Zeiss Telescopic Spectacles for
Diagnosis and Surgery
Carl Zeiss Spectacle Magnifiers

DENVER, COLORADO

Symonds-Atkinson Optical Company
424 Sixteenth Street
Denver's only strictly dispensing opticians

DENVER, COLORADO

Paul Weiss, 1620 Arapahoe Street
Prescription Optician
FUSION TUBES
OPTICAL DEMONSTRATION SETS
Optical Specialties made to order.

PORTLAND, ORE.

Hal H. Moor, 315 Mayer Bldg.
Dispensing Optician
Oculists' prescriptions exclusively.

PASADENA, CALIFORNIA

Arthur Heimann
Guild Optician
36 N. Madison Ave.

NEWARK, N. J.

J. C. Reiss, Optician
Dispensing Exclusively
10 HILL STREET
Oldest Optical House in New Jersey
Established 1892
Member Guild of Prescription Opticians of
America

PHILADELPHIA, PA.



Prescription Opticians—since 1890

SAN FRANCISCO, CALIF.

John F. Wooster Company
234 Stockton St.
Prescription Opticians

ST. LOUIS, MO.

Erker Bros. Optical Co.
610 Olive Street
518 N. Grand Boulevard
Established 1879
Member Guild of Prescription Opticians of
America



Pat. Nos.
226271/24
322237/23

LONDON ENGLAND
THEODORE HAMBLIN, LTD.
DISPENSING OPTICIANS (EXCLUSIVELY)
15 WIGMORE STREET, LONDON W.1.

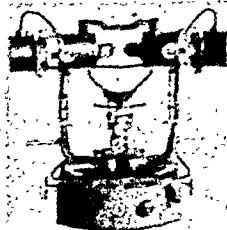
PATENTEES OF

"SPECTETTES"

THE POPULAR FOLDING SPECTACLES

MADE FOR THE AMERICAN MARKET BY

The May Manufacturing Co., Inc., 146 West 29th St., New York



THE PUGH
ORTHOPTOSCOPE
The most
modern apparatus
for orthoptic training

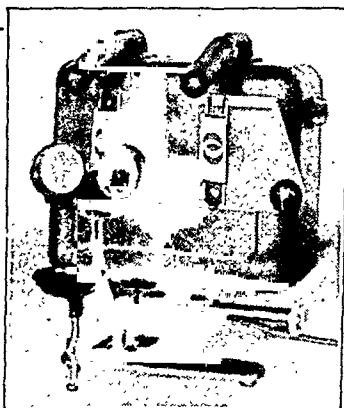
Orthoptic Training Is Here



ORTHOPTIC TRAINING is being adopted by Ophthalmologists, clinics, and hospitals, as a vital addition to refraction itself. One of the main reasons for this widespread adoption of Orthoptic Training is the Rotoscope, which simplifies Orthoptic Training. THE ROTOSCOPE IS AN INSTRUMENT WITH BASICALLY-SOUND FEATURES COMBINED INTO ONE COMPACT UNIT, so simplified that the assistant can do the training herself. And that is why the Rotoscope is being used for Orthoptic work by leading Ophthalmologists, clinics, and hospitals the country over. The Rotoscope brings *results* with the most difficult "squint" cases to the simpler convergence insufficiencies, and is a valuable aid in making patients more comfortable with their glasses. And yet, the work has just begun—the full possibilities of Orthoptic Training with the Rotoscope are just beginning to be realized. That is why we urge you to investigate the Rotoscope—*what it will actually do!* Any distributor listed below will demonstrate this finest of Orthoptic instruments—the Wottring Rotoscope! Write for descriptive booklet!

Wottring ROTSOCPE

Simple to operate
Basically sound features
RESULTS



FEATURES in BRIEF

- Diagnostic value as well as for training
- Based on stereoscope, plus rotary motion for results
- Develops fusion and stereopsis at the same time
- Ideal for "squint" cases
- Desirable features in ONE instrument.

DISTRIBUTORS of the WOTTRING ROTOSCOPE

- COLONIAL OPTICAL CO.
62 West 47th Street, New York
- MCINTIRE, MAGEE & BROWN CO.
9th and Sansom Streets, Philadelphia
- RIGGS OPTICAL COMPANY
1449 Merchandise Mart, Chicago

- IMPERIAL OPTICAL CO.
Toronto, Canada
- NATIONAL OPTICAL CO., Ltd.
Montreal, Canada

- RIGGS - ASSOCIATED OPTICAL CO.
Flood Bldg., San Francisco, Calif.
- SOUTHEASTERN OPTICAL CO., Inc.
Richmond, Va.
- THE WHITE - HAINES OPTICAL CO.
Columbus, Ohio

Keep in step with PROGRESS

After several years of economy, professional men are catching up with advancements in instruments and equipment.

One judicious place to start modernizing is the refracting room. The first acquisition should be a new American Optical De Luxe Hydraulic Unit.

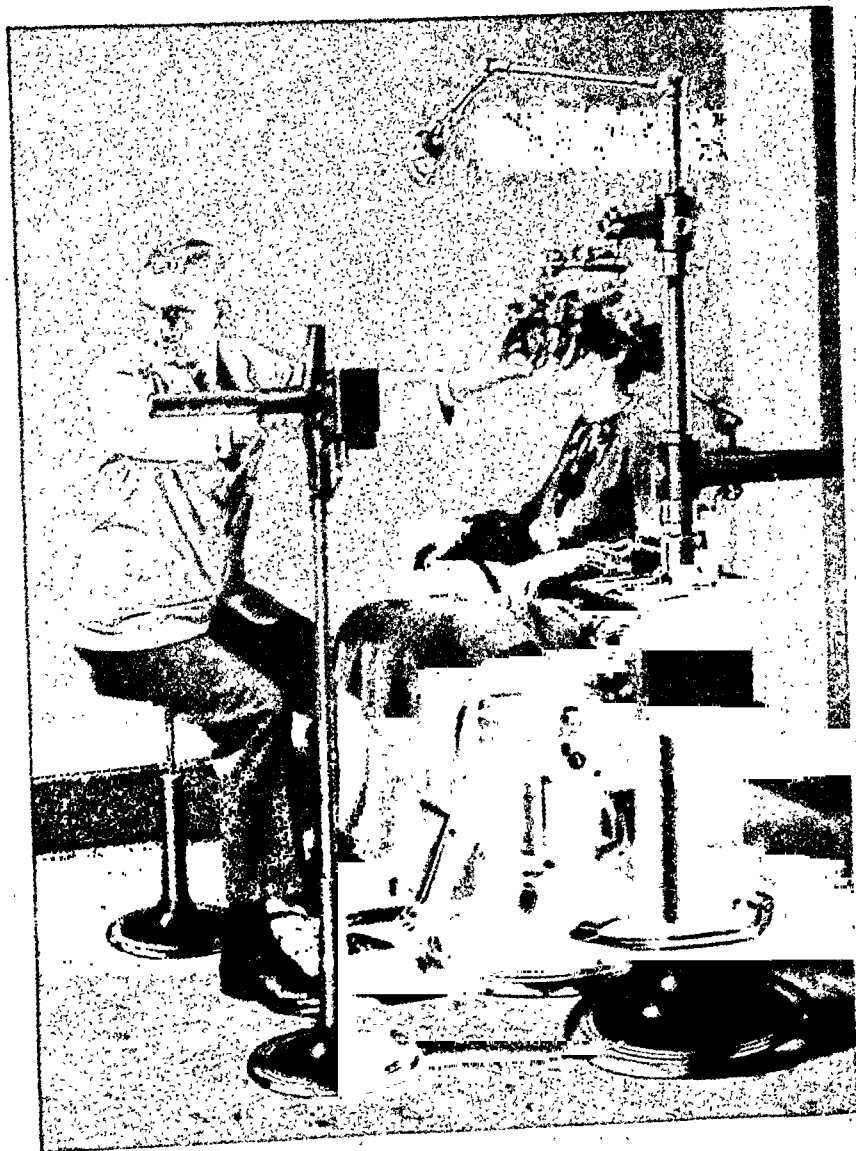
Simplified, feather-touch operation with exact, locking control; self-contained current control cabinet; leak-proof hydraulic mechanism... these are a few of the features which help to expedite and successfully accomplish the examination.



De Luxe

HYDRAULIC UNIT

American Optical Company



THE MODERNIZATION CREDIT PLAN

American Optical Chairs and Units, and certain other equipment, are on the approved list for Federal Loans under the Modernization Credit Plan. Ask your American Optical Branch for information on this and on the American Optical Budget Payment Plan.

AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

Original Papers	Page
Roentgen-ray cataract. P. J. Leinfelder and H. D. Kerr	739
The minor sequelae of eye contusions. M. Davidson	757
The fluorescent lamp for cataract surgery. H. Rommel Hildreth	770
A critical summary of surgical experiences in 1934. Emory Hill and Robert H. Courtney	773
Meningococcus conjunctivitis followed by septicemia and beginning meningitis. Fred M. Reese	780
Staphylococcus toxin combined with lens extract as a desensitizing agent in individuals with a cutaneous sensitivity to lens extract. Earl L. Burky and Herbert C. Henton	782
An illuminating device to be used as an attachment to the binocular corneal microscope for gonioscopy and goniophotography. Ramon Castroviejo	786
Paralysis of divergence of functional origin. C. P. Clark	789
Notes, Cases, Instruments	
Spontaneous rupture of the sclera (tuberculous). Frances Richman ..	792
A modified capsule forceps for cataract extraction. Charles E. Walker, Jr.	794
An unusual case of bilateral retinal detachment. Dohrmann K. Pischel	795
Eye complications following the use of reducing agents. Wilber F. Swett	796
Society Proceedings	
Colorado, Philadelphia, Washington, New England	798
Editorials	
Corneal transplantation; Optimum light; Short courses for specialists	805
Book Notices	809
Abstract Department	810
News Items	840

For complete table of contents see advertising page V

Copyright, 1936, Ophthalmic Publishing Company, 640 South Kingshighway, Saint Louis, Missouri

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars.

Published monthly by the George Banta Publishing Company, 450 Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company, Kingshighway, Saint Louis, Missouri

Editorial Office: 640 S. Kingshighway, Saint Louis, Missouri

Entered as second class matter at the post office at Menasha

Free
R
reprints

ANNOUNCING

THE HILDRETH SURGICAL ULTRAVIOLET LAMP

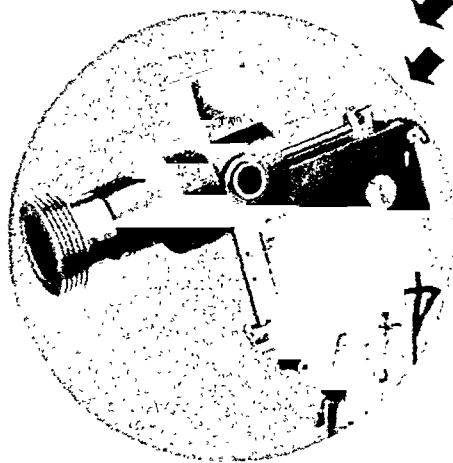
*A New Development That Makes
Cataract Extractions And The Re-
moval Of Dislocated Lenses Easier*

● Greater ease and assurance in operations involving the crystalline lens are yours with the new Hildreth Lamp. Making use of a known principle that the crystalline lens fluoresces under ultraviolet light, the Hildreth Lamp directs the long ultraviolet rays, which are inactive biologically, into the eye and makes the entire lens cortex visible thruout the operation.

In the surgical manipulation of intracapsular extraction, ophthalmologists find that with the lens fluorescent, the plane of the capsule is more easily located and the chance of rupture lessened. In cases in which the capsule is accidentally torn, the removal of the cortex and remnants of the capsular material is facilitated because of the enhanced visibility. Fluorescence also simplifies the removal of dislocated lenses.

SPECIAL FILTERS WIDEN APPLICATION

- Because of the high amount of ultraviolet generated by the Hildreth Lamp, it may be used with special filters for ultraviolet therapy.
- Other filters, which are opaque to everything but the longer red rays, adapt the lamp to use in infrared photography.
- With a special green filter, the lamp can be used as an illuminant in conjunction with the hand Loring Ophthalmoscope for red-free ophthalmoscopy.
- A special white U V and heat absorbent filter makes the Hildreth Lamp into an operating lamp.
- A blue filter transmits a non-glaring intense light for clinical black and white photography. Sharper negatives are obtained by the monochromatic light.



Write for further in-
formation and prices

H G G S OPTICAL COMPANY

Describing the use of this lamp are available upon request to our Chicago office

ARTIFICIAL EYES

TRUE TO LIFE



Fitted with Reform Eye shortly after operation
Remarkable motion, no noticeable depression

LIFELIKE ARTIFICIAL EYES that match with wondrous fidelity the human eyes they companion. All the wealth of MODERN SCIENCE, plus the skill of our artisans who have spent a lifetime at their art . . . is at your service here. Leading Ophthalmologists have looked to us for a generation . . . for fit, comfort and enduring satisfaction, as well as PERFECT RESEMBLANCE.

SELECTIONS ON APPROVAL

For Ophthalmologists who prefer to do their own fitting from our large and complete stock of Blended Iris Reform and Shell Eyes.

EYES MADE TO ORDER

Exact Duplication Assured

Gold and Glass Spheres Carried in Stock

Our Experts Make Regular Visits to Principal Cities

FRIED & KOHLER, INC.

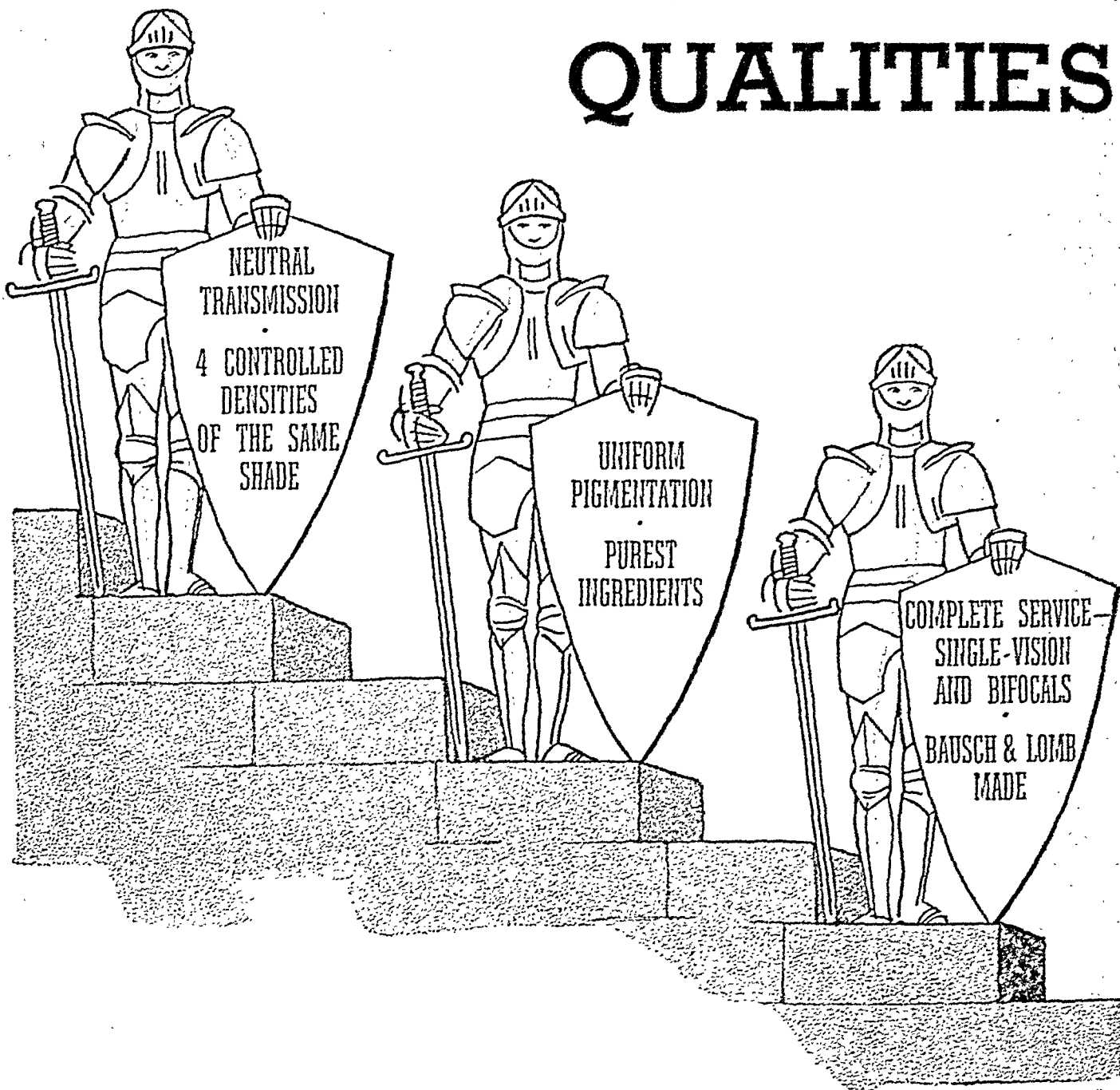
Specialists in Artificial Human Eyes Exclusively

665-5th Ave. near 53rd St.

New York City, N. Y.

"Over thirty-nine years devoted to pleasing particular people"

QUALITIES

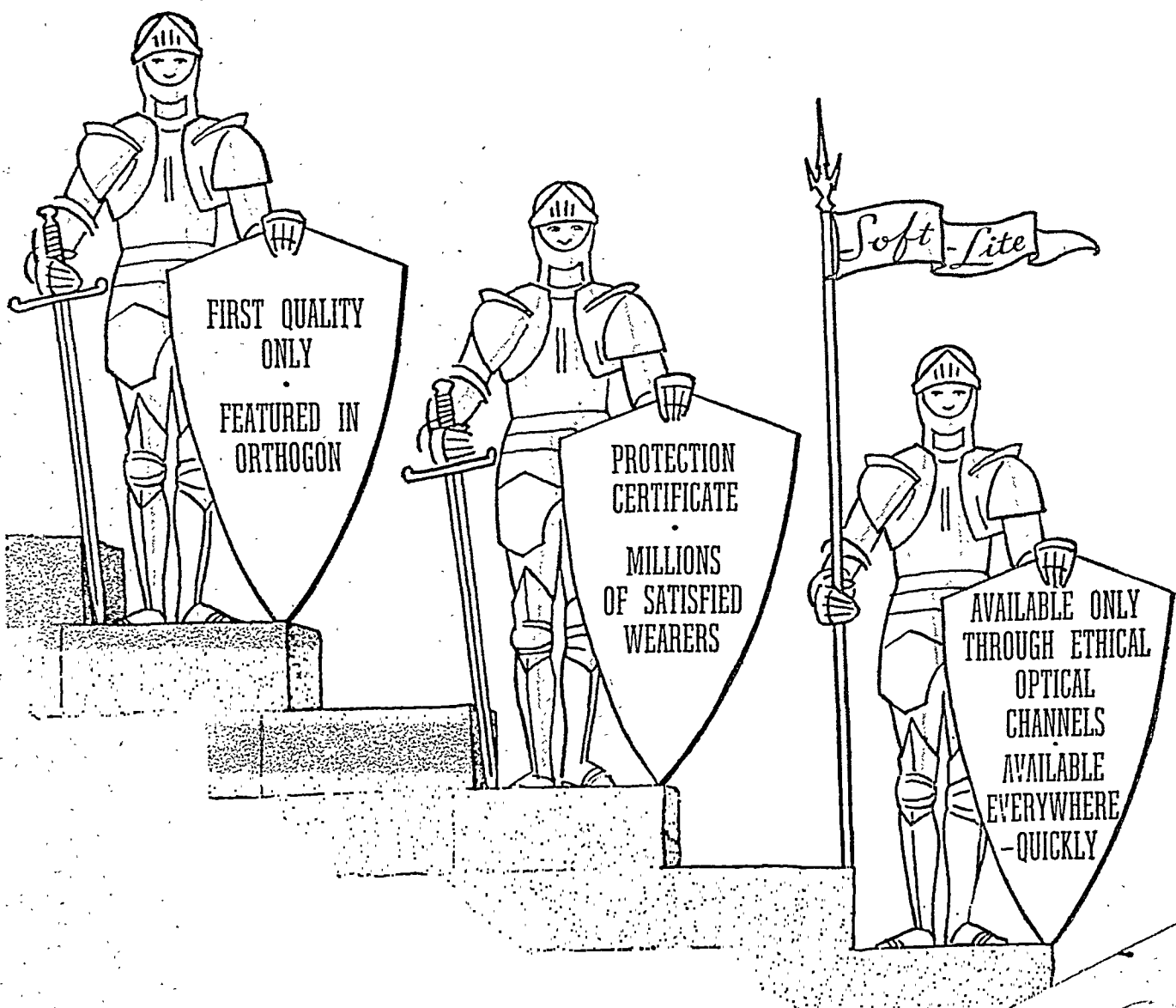


*Soft-Lite
Lenses*

SOFT-LITE LENS COMPANY, INC.

OF LEADERSHIP

A few reasons why there are more satisfied wearers of Soft-Lite lenses today than ever before—features that have made Soft-Lite the absorptive lens standard of the world.



An Invitation

At the forthcoming meeting of the American Academy of Ophthalmology and Otolaryngology to be held at the Waldorf-Astoria Hotel, New York City, September 26th to October 3d, our firm will have an exhibit booth as usual.

Our exhibit will include models fashioned in glass of pathological conditions of eyes as well as models of traumatized eyes; Special models used in correction of ptosis and anatomical shapes employed to overcome depression of upper lid and produce maximum mobility of prothesis; Eyes used in cases of exenteration with lids and tissue of glass, as well as various forms of contact shell prothesis to be worn over shrunken or deformed eyeballs.

We invite you to review the above referred to exhibition and if you have any problems relating to our specialty our Mr. Paul Gougelmann, from Chicago office, or Mr. Pierre Gougelmann and Mr. Fred Michel, from our New York office, will be glad to discuss them with you.

Eyes made to order by
skilled artisans.

On approval by mail from
sample or description.

*

*

Fitted from largest stocks
by experts.

Solid gold and glass spheres
at all offices and sent on ap-
proval.

*

Artificial eye service since 1851.

MAGER & GOUGELMANN, Inc.

Eastern Division			
NEW YORK 510 Madison Ave.	PHILADELPHIA 1930 Chestnut St.	BOSTON 230 Boylston St.	WASHINGTON, D.C. 207 Albee Bldg.
Western Division			
CHICAGO 30 N. Michigan Ave.	DETROIT 805 Empire Bldg.	MILWAUKEE 710 N. Plankinton Ave.	KANSAS CITY 1105 Rialto Bldg.
CLEVELAND 913 Schofield Bldg.	PITTSBURGH 803 May Bldg.	ST. LOUIS 201 Metropolitan Bldg.	MINNEAPOLIS 325 Medical Arts Bldg.

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3, Vol. 19, No. 9

SEPTEMBER, 1936

CONTENTS

Frontispiece, color plate illustrating paper by Drs. Leinfelder and Kerr.

Original Papers

	Page
Roentgen-ray cataract. P. J. Leinfelder and H. D. Kerr	739
The minor sequelae of eye contusions. M. Davidson	757
The fluorescent lamp for cataract surgery. H. Rommel Hildreth	770
A critical summary of surgical experiences in 1934. Emory Hill and Robert H. Courtney	773
Meningococcus conjunctivitis followed by septicemia and beginning meningitis. Fred M. Reese	780
Staphylococcus toxin combined with lens extract as a desensitizing agent in individuals with a cutaneous sensitivity to lens extract. Earl L. Burky and Herbert C. Henton	782
An illuminating device to be used as an attachment to the binocular corneal microscope for gonioscopy and goniophotography. Ramon Castroviejo ..	786
Paralysis of divergence of functional origin. C. P. Clark	789

Notes, Cases, Instruments

Spontaneous rupture of the sclera (tuberculous). Frances Richman	792
A modified capsule forceps for cataract extraction. Charles E. Walker, Jr.	794
An unusual case of bilateral retinal detachment. Dohrmann K. Pischel	795
Eye complications following the use of reducing agents. Wilber F. Swett	796

Society Proceedings

Colorado Ophthalmological Society, October 19, 1935	798
College of Physicians of Philadelphia, Section on Ophthalmology, December 19, 1935	801
Washington, D.C., Ophthalmological Society, January 6, 1936	802
New England Ophthalmological Society, January 21, 1936	804

Editorials

Corneal transplantation	805
Optimum light	807
Short courses for specialists	808

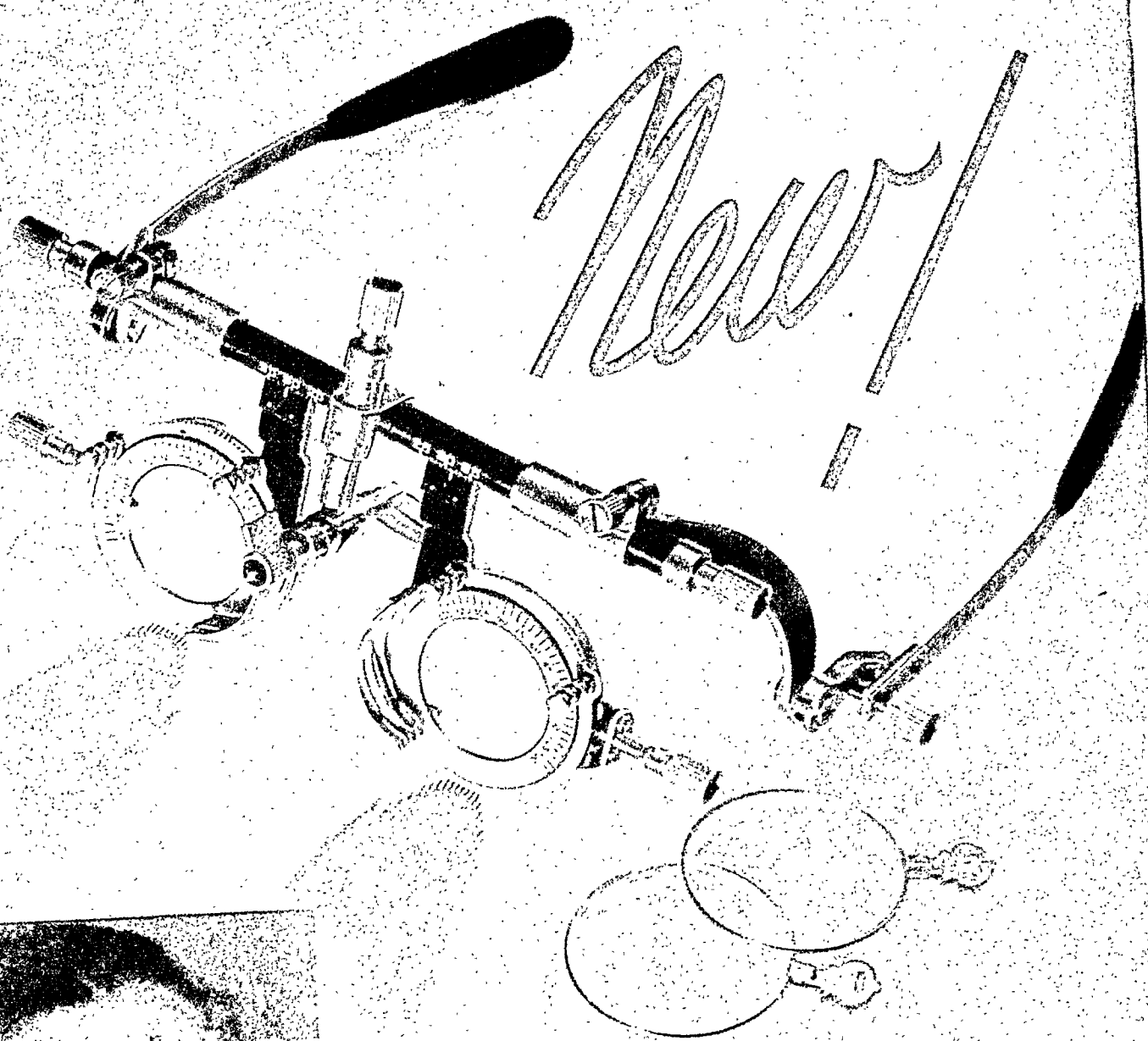
Book Notices

La radiographie en ophtalmologie. Atlas clinique.	809
--	-----

Abstract Department

Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus; Tumors; Injuries; Systemic diseases and parasites; Hygiene, sociology, education, and history; Anatomy, embryology, and comparative ophthalmology	810
--	-----

News Items	840
------------------	-----



... a Trial Frame that fits *all* patients!

Built to an entirely new design, the Bausch & Lomb Universal Trial Frame is a versatile and convenient refracting aid. Features of this design include the adaptability for use on any patient, child or adult, the individual angling of temples to conform to any head shape, and the positive centering of lenses, regardless of pupillary distances. Ask your wholesaler's representative for a demonstration.

BAUSCH & LOMB
 OPTIC COMPANY, ROCHESTER, N. Y.

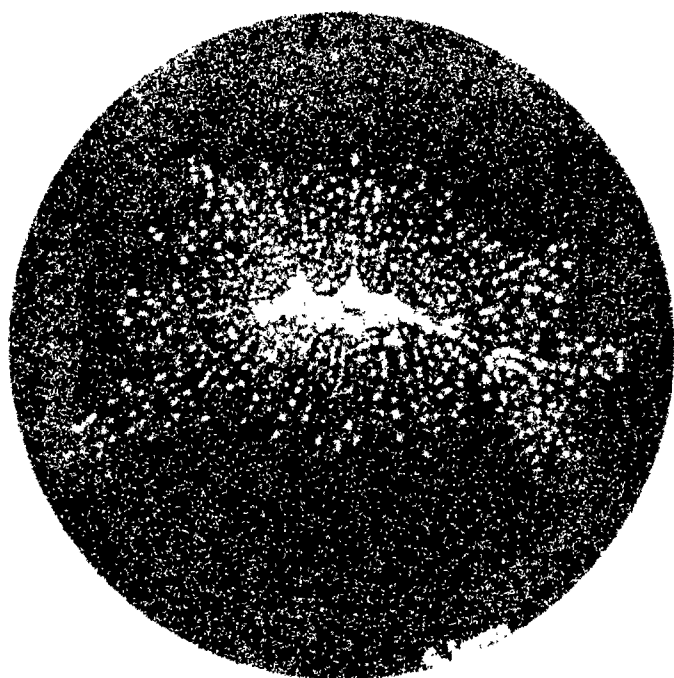


FIG. 1 (LEINFELDER AND KERR). OPHTHALMOSCOPIC APPEARANCE OF STATIONARY POSTERIOR POLAR CATARACT IN A RABBIT

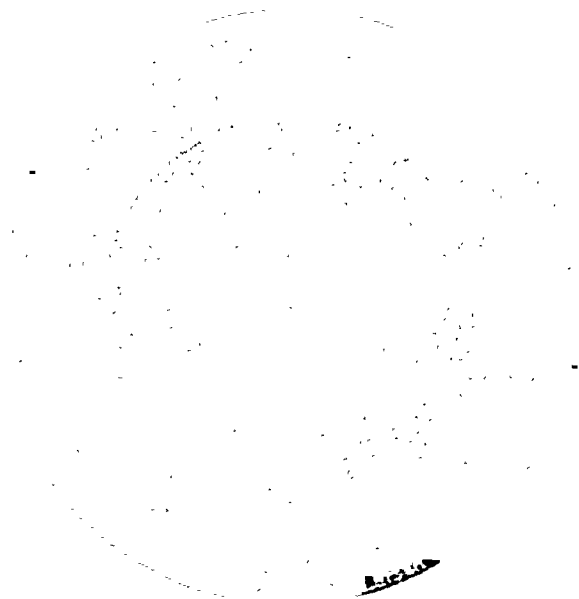


FIG. 2 (LEINFELDER AND KERR). LATE APPEARANCE OF THE LENS. RABBIT I-2.

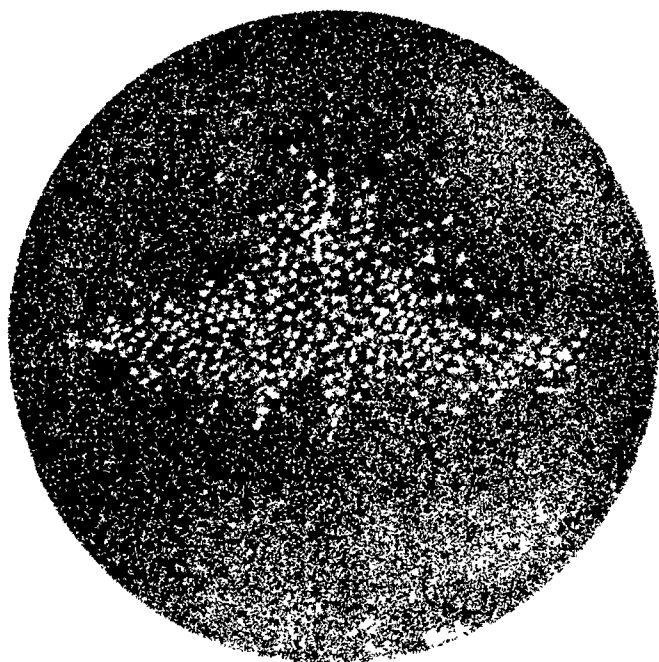


FIG. 3 (LEINFELDER AND KERR). OPHTHALMOSCOPIC APPEARANCE OF STATIONARY POSTERIOR POLAR OPACITIES RABBIT II-1.

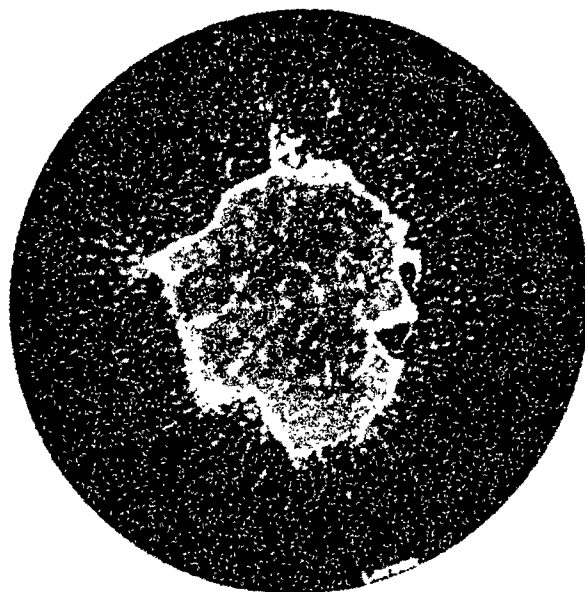


FIG. 4 (LEINFELDER AND KERR). OPHTHALMOSCOPIC APPEARANCE OF POSTERIOR POLAR OPACITIES, CASE 2

ROENTGEN-RAY CATARACT

An experimental, clinical, and microscopic study

P. J. LEINFELDER, M.D. AND H. D. KERR, M.D.

IOWA CITY, IOWA

The eyes of several groups of rabbits were exposed to various doses of roentgen rays. Observations were continued over a period of two-and-a-half years and showed that lens changes developed in all cases. The usual opacity which consisted of small punctate dots in the posterior polar region was not progressive.

Clinical observations were made on five patients who had received roentgen-ray therapy in the region of the eyes. Of these patients, two children developed cataracts two years after treatment, while the three adults showed no opacities up to thirty months following irradiation.

Microscopic examination was made of the rabbit lenses and of the lenses from four patients who had received roentgen-ray therapy in the ocular region. Histologic evidence of cataract, consisting of equatorial, posterior polar and anterior and posterior cortical changes, was present in all lenses. The study indicates that the crystalline lens will tolerate ordinary therapeutic doses of roentgen rays, especially when the available methods of shielding are used. From the Departments of Ophthalmology and Roentgenology, College of Medicine, University of Iowa. Read before the Association for Research in Ophthalmology, at Kansas City, Missouri, May 12, 1936.

Part I

Confusion concerning the effects of the roentgen ray upon the lens has existed since 1897 when Chalupecky¹ noted anterior polar cataract in irradiated experimental animals. A few years later Birch-Hirschfeld² reported that the lens in man and animals remained clear following exposure to roentgen rays, but in 1904 he³ noted that, after irradiation of the fetus *in utero* opacities developed in the lens. Von Hippel⁴ found that cataract was more frequent in irradiated than in normal eyes of embryos. A succession of experiments by Bossuet,⁵ Stock,⁶ Birch-Hirschfeld,⁷ Rados and Schinz,⁸ Stumpf,⁹ Jacoby,¹⁰ Rohrschneider,¹¹ Aulamo,¹² and Gassteiger and Grauer,¹³ because of conflicting results, did not entirely clarify the subject. The reports of numerous cases of cataract in human lenses following irradiation (Birch-Hirschfeld,¹⁴ Paton,¹⁵ Axenfeld,¹⁶ Salzer,¹⁷ Horay,¹⁸ Dor,¹⁹ Pfahler,²⁰ Salus,²¹ Ziegler,²² Ascher,²³ Scheerer,²⁴ Davids,²⁵ Rohrschneider,¹¹ Meesmann,²⁶ Stallard,²⁷ and Milner,²⁸) confirmed the opinion that the lens was sensitive to roentgen rays and that

cataract was a likely result of irradiation. In some instances, however, the relationship between the cataract and roentgen-ray exposure was doubtful because of the advanced age of the patients. Many of the cases, nevertheless, appear to have been solely the result of the roentgen-ray irradiation. Partial cataract in human lenses was noted in eyes which had been protected by lead—Rohrschneider, Horay, and Meesmann—while in Paton's case the eye was shielded with rubber.

The dosages of roentgen rays described in the reported cases and in the experimental work are on the basis of skin-erythema doses (H.E.D.); yet this is not exact, for 100-percent H.E.D. may be given in a number of ways—as a massive dosage of the short or hard rays or a less intense dosage of the long or soft rays. Often the filtration is not stated, and no idea can be formed concerning the quality of the rays. In the experimental reports this omission makes it impossible to compare results with the effects of present-day therapy and the methods described seem to in-

dicating a desire to produce lens changes rather than to study the effect of usual therapeutic doses on the lens.

In an attempt to demonstrate the sensitivity of the lens to the ordinary therapeutic doses of roentgen rays, the following investigations were made: 1. In the first part of the study, roentgen irradiation similar to that used in the treatment of malignancies in the orbital region was given to a series of normal rabbits. 2. Observations of patients with malignancies in the ocular region who had been treated according to the principles of modern therapy and without consideration of possible damage to the lens. When possible, the eye adjacent to the lesion was not directly exposed to the rays, but in some cases protection was impracticable and the eye received full dosage. 3. Microscopic examinations of the irradiated animal and human lenses.

Experimental

Experimental studies were made on five groups of rabbits. In each rabbit one eye was irradiated with roentgen rays while the opposite eye was completely shielded by 2 mm. of lead, and served as a control.

Group I. Three rabbits received, at three-day intervals, three treatments of 900 roentgens to one eye. The factors were 133 K.V., 5 ma., at 50 cm., with filtration by 1 mm. of aluminum. The total dosage for each animal in this group was 2700 roentgens in six days.

Group II. Three rabbits received in one eye the roentgen rays produced by 200 K.V., 5 ma., at a distance of 50 cm. and filtered through .5 mm. copper and 1.0 mm. aluminum. The dosage in the single treatment was 600 roentgens.

Group III. Three rabbits were treated 15 times in 22 days with 200 roentgens, produced by 200 K.V., 20 ma., at 50 cm., filtered with the Thoraeus* plus 1 mm. aluminum.

Group IV. Three other rabbits were given 200 roentgens daily for 10 days, with 200 K.V., 6 ma., at a distance of 50 cm. and filtered by .5 mm. copper and 1.0 mm. aluminum. The total dosage was 2000 roentgens in 10 days.

* Thoraeus filter = .4 mm. tin, .25 mm. copper, and 1.0 mm. aluminum.

Group V. Each of two rabbits was given a single exposure of roentgen rays produced by 90 K.V., 5 ma., at a distance of 37½ cm. No filter was used and the dosage was 1200 roentgens.

Observation of the rabbits was made at weekly intervals during the first three-and-a-half months. Later examinations were less frequent, varying from once every two weeks to once a month toward the end of the experimental period.

Conjunctivitis in the irradiated eye was the earliest manifestation of the activity of the roentgen rays. It was characterized by a purulent discharge and a red thickened palpebral conjunctiva. The duration of the inflammation was from a few days to four weeks. The fact that the inflammation was unilateral and in most instances affected each of the three rabbits in a group at the same time indicated that the roentgen rays were the etiologic agent.

In Group I, all three animals were affected. The inflammation began in the second week after the first treatment; it lasted about four weeks and was more protracted than in any of the other groups. In Group III, a slight transitory conjunctivitis developed. In one rabbit, reddening of the palpebral conjunctiva occurred on the 14th day after the first treatment, while in the others it was noted on the 22d day. The three rabbits in Group IV were observed to have a moderate conjunctivitis on the 15th day after the first treatment; no inflammation was present at the examination one week later. Both rabbits in Group V had a moderately severe conjunctivitis when examined on the 13th day after treatment; there was no evidence of inflammation on the 9th or 20th days. Group II showed no inflammation at any time.

Epilation occurred in varying degrees. The rabbits in Group I began to lose hair about the treated eye on the 38th day, and complete epilation had occurred on the 56th day. There was no epilation in Group II. In Group III it had begun on the 28th day, and on the 42d day had reached a maximum of 50 percent. Epilation of 20 percent occurred in 86 days over the treated area of the rabbits of Group IV. The rab-

bits of Group V showed the first signs of loss of hair on the 7th day and it was complete on the 56th day. In all the animals except those of Group V regrowth of hair occurred.

Changes in the lenses were observed in all irradiated eyes. The first ophthalmoscopic indication of cataract was the appearance of fine bubbles situated under the posterior capsule around the entire periphery of the lens. With passage of time the bubbles gradually increased in extent and covered most of the posterior subcapsular region. Later a horizontal aggregate of bubbles which developed at the posterior pole eventually contracted to a dense, irregular, linear opacity from which radiated rows of small vacuoles (fig. 1). The opacities remained posterior subcapsular during the entire course of observation. Anterior subcapsular opacities were rare. Slitlamp examination was not routine, but when utilized showed the usual appearance of posterior subcapsular cataract.

In Group I the posterior subcapsular opacities were noted in the periphery 62 days after the first treatment. An increase in extent of the opacity and fine anterior subcapsular opacities were observed on the 126th day. Progression was gradual and on the 160th day there was diffuse opacification by small bubbles in the entire posterior subcapsular region. This occurred in all three eyes, and in the two rabbits which lived the opacities progressed; under diffuse illumination the lenses appeared translucent but with the slitlamp minute opaque flocculi were observed in the cortex. The lens of rabbit no. 3 became opaque and remained unchanged after 189 days, while rabbit no. 1 progressed very slowly until at the present time, 29 months after treatment, the lens is similar to no. 3's and shows irregular, granular, anterior subcapsular and cortical changes and diffuse opacities in the posterior region (fig. 2). Rabbit no. 2 was killed after 17 months for histologic study, and at that time the posterior regions were diffusely cloudy, with a suggestion of concentration of the opacity in a central line. Some anterior subcapsular opacities were present.

In Group II opacities were noted in the posterior subcapsular region after 136 days. On the 194th day a band of fine bubbles had developed in the posterior polar region (fig. 3). Observations, made over a total period of 28 months, demonstrated no further changes. This group showed the least lens change of any of the animals treated.

Group III developed peripheral posterior subcapsular bubbles by the 81st day after the first treatment. These had extended to the entire posterior subcapsular region on the 178th day, and in 286 days had contracted to a dense horizontal posterior polar line with radiating striae of bubbles (fig. 1). These lenses showed no further change in the 28 months of observation.

Posterior subcapsular bubbles were observed 66 days after the first treatment in Group IV; these had formed a bandlike opacity on the 282d day which remained unchanged 18 months later.

Group V had posterior subcapsular opacities after 179 days, and in 265 days this had changed to a dense linear opacity with radiating bubbles. No change was noted up to 25 months.

Summary

Cataractous changes occurred in the lenses of rabbits treated with the usual therapeutic doses of roentgen rays. The lenses showed the same early manifestations in all cases and the developmental morphology was consistently similar. The evolution of the opacity from a peripheral to a rather diffuse posterior subcapsular one, which, in turn, became a localized denser, stationary, scarlike opacity appears to indicate that the cataract is not progressive, but is the result of local damage at the time of irradiation that becomes visible with the further growth of the lens. Comparative analysis of the effects of the different dosages was not meant to be a part of the problem, and an accurate basis for drawing conclusions does not exist. It can be said, however, that the rabbits that received the smallest dose, Group II, also developed the least lens opacity, while those that received the greatest dosage in the shortest time (Group I) developed the great-

Table 1
RESULTS OF EXPERIMENTAL IRRADIATION OF RABBIT EYES

Group	Animal	Dosage	Type of ray	Conjunctivitis	Epilation percent	P.S.C.* days	A.S.C. ^o days	Result
I	1	2700 r in 6 days	long	+	100	83	126	Opalescence Histology Opalescence
	2	2700 r in 6 days	long	+	100	62	126	
	3	2700 r in 6 days	long	+	100	62	126	
II	1	600 r in 1 day	short	—	0	139	—	Very fine posterior dots unchanged after 194 days
	2	600 r in 1 day	short	—	0	136	—	
	3	600 r in 1 day	short	—	0	?	—	
III	1	3000 r in 22 days	short	sl.	50	81	—	Posterior polar unchanged after 268 days
	2	3000 r in 22 days	short	sl.	50	71	—	
	3	3000 r in 22 days	short	sl.	50	81	—	
IV	1	2000 r in 10 days	short	+	20	?	—	Posterior polar unchanged after 282 days
	2	2000 r in 10 days	short	+	20	115	—	
	3	2000 r in 10 days	short	+	20	66	—	
V	1	1200 r in 1 day	long	+	100	179	—	Posterior polar unchanged after 265 days
	2	1200 r in 1 day	long	+	100	179	—	

* P.S.C. First appearance of posterior subcapsular changes.

^o A.S.C. First appearance of anterior subcapsular changes.

est opacity. The injury produced by 3000 roentgens in 22 days caused little more change than did 2000 roentgens in 10 days.

Corneal change that could be attributed to the roentgen rays was not observed. Many times corneal denudations were noted, but on examining the

untreated eyes, similar denuded areas were also seen. These were perhaps due to trauma.

Hyperemia of the iris or iridocyclitis was not observed, and except for a transient purulent conjunctivitis and epilation no external manifestations of the treatments occurred.

Part II

Clinical study

Clinical observations were made of a number of patients who had received roentgen-ray therapy in the region of the eyes. Of this number only the five patients reported below were observed over a sufficient period of time (20 to 38 months) to warrant any conclusions. It is realized that the absence of lens changes within such a period of time does not preclude the possibility of future changes. Included in this report were two children in whom cataracts developed and three adults who showed no evidence of lens changes.

Case 1. D. J., a girl, aged 7 years, received roentgen-ray and radium therapy to the right and left orbits for an adamantinoma of the right ethmoid

region. The dosages were as follows:

Right Orbit	
May	
12, '33	lat.
13	ant.
16	lat.
17	ant.
18	lat.
19	ant.
22	lat.
22	ant.
25	lat.
26	ant.
31	lat.
June	
1, '33	ant.
3	lat.
4	ant.
7	lat.
8	ant.

200 K.V. Thoracuss
filter 200 r

Total direct dosage right orbit, 3200 r in 27 days.

Left Orbit		200 K.V. Thoracuss filter 200 r
May		
15, '33	lat.	
18	lat.	
20	lat.	
23	lat.	
27	lat.	
June		
2, '33	lat.	
6	lat.	

Total direct dosage left orbit, 1400 r in 22 days.

On May 24, 1933, 1401 mg. hrs. of radium was applied to the right orbit and ethmoids by needles inserted into the region. These needles had a wall thickness of 0.5 mm. platinum.

Examination of the eyes on January 3, 1934, revealed normal vision, lenses, and fundi. On July 1, 1935, the vision in the right eye was only 6/60, while in the left it remained normal. Ophthalmoscopic examination of the right eye showed punctate opacities in the posterior and anterior subcapsular regions. The fundus was seen with difficulty but an edema of the nerve head was observed. Slitlamp examination of the lens revealed a diffuse, irregular haze of the anterior subcapsular region which was due to fine, irregular, white flocculi and gray streaks that conformed to lens fibers. In the posterior subcapsular region was a typical saucer-shaped complicated cataract; it was most dense at the posterior pole, light brown in color, and contained iridescent crystals. In the left lens observation with the ophthalmoscope showed a posterior polar opacity, approximately 3 mm. in diameter, which appeared as black, coalesced, punctate globules with similar discrete opacities radiating toward the equator. With the slitlamp no anterior opacities were seen, but there was an opacity in the posterior subcapsular region which was smaller and less dense than that in the right lens. The fundus was normal. In August, two months later, vision in the right eye had diminished to ability to count fingers at 1 meter; the lens was more opaque and the fundus invisible. The left eye had not changed.

In December, 1935, the vision of the right eye was reduced to hand movements and, ophthalmoscopically, only a faint fundus reflex was obtained. Slitlamp observation showed an increase in the white, anterior, radiating, subcapsular opacities and the small coalescing flocculi. There were many punctate white opacities in the anterior cortex and in the nucleus. Posterior cortical and subcapsular changes appeared to be of a similar nature but were poorly seen. The vision in the left eye was 6/9 and the appearance of the lens was similar to that at previous observations.

In March, 1936, vision in the right eye was reduced to perception of light and shadow. The iris had become atrophic, and the lens was more opaque, glistening golden yellow in color, and swollen. Large vacuoles and white punctate opacities were seen beneath the anterior capsule. The posterior layers of the anterior cortex were clouded but nuclear opacities were still visible. Vision in the left eye was 6/9 + 3 and the lens had undergone no further changes.

Summary: In a girl of 7 years opacities developed in the lens of each eye following short-wave roentgen therapy. The opacities developed between the 19th and 25th month after treatment and were rapidly progressive in the eye receiving the greater dosage; opacities which remained stationary formed in the posterior polar region of the opposite eye. The degree of injury to the right lens by the radium (a calculated equivalent dosage of approximately 1400 to 2100 r) is not estimated but because of the distance factor it is our opinion that there was a negligible radium effect on the left lens. The etiology of the papilledema and iris atrophy which occurred in the right eye, 25 and 31 months respectively after treatment, is not known. The neoplasm has not recurred.

Case 2. B. B., a girl, 11 years of age, began roentgen-ray treatment in February, 1933, for a fibrosarcoma of the left orbit. The vision at that time was 6/6 in the right eye and 6/15 in the left. The lenses and fundi were normal.

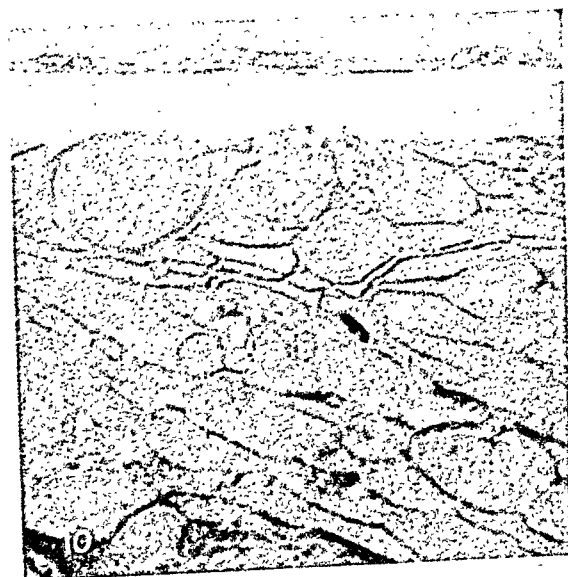
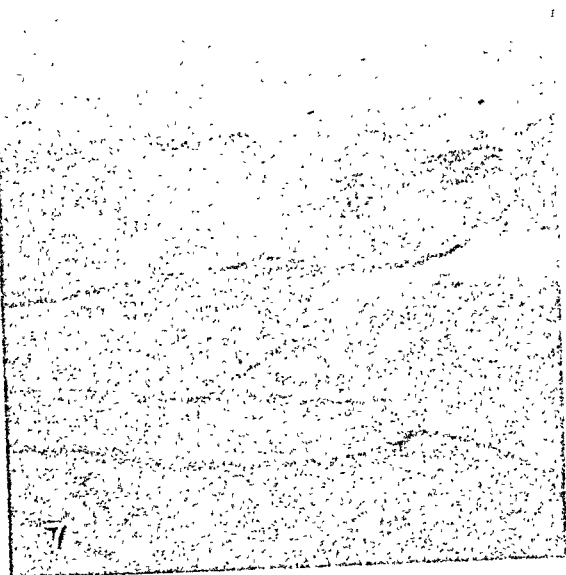
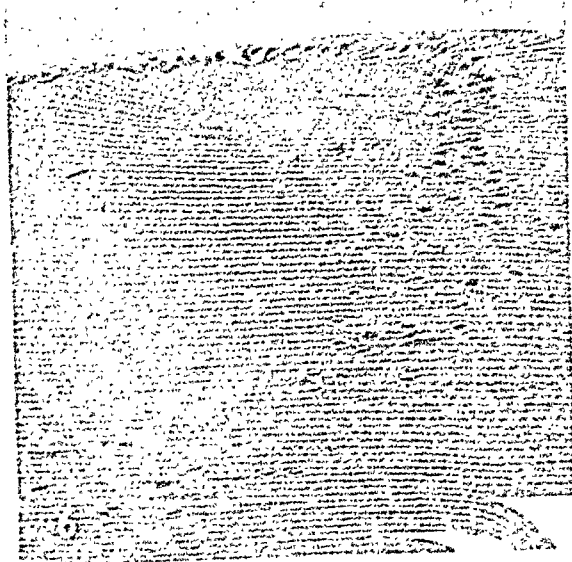
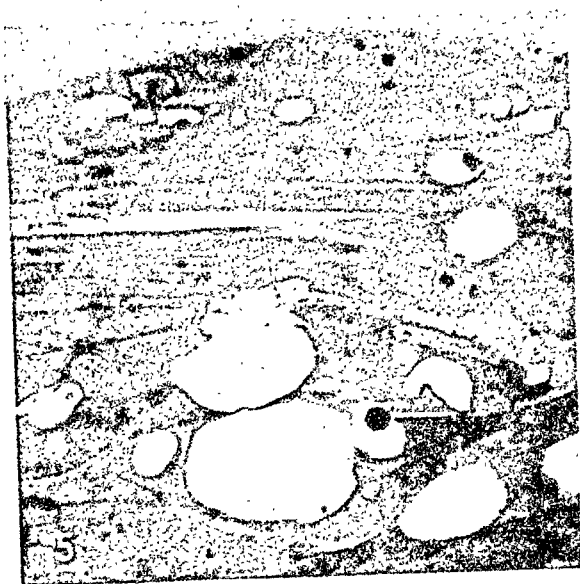


Fig. 5 (Leinfelder and Kerr). Equatorial region. Rabbit I-2.
 Fig. 6 (Leinfelder and Kerr). Equatorial region. Normal rabbit.
 Fig. 7 (Leinfelder and Kerr). Lens epithelium at equator. Rabbit I-2.
 Fig. 8 (Leinfelder and Kerr). Posterior subcapsular region. Rabbit I-2. The equator is toward the left.
 Fig. 9 (Leinfelder and Kerr). Lens bow. Rabbit I-2.
 Fig. 10 (Leinfelder and Kerr). Anterior subcapsular and cortical regions. Rabbit I-2.

Table 2

CLINICAL RESULTS OF IRRADIATION OF HUMAN EYES

Case	Age	Quality	Dosage	Elapsed Time Since Treatment	Results	Latent Period
1	7	Short	O.D. 3200 r in 27 days O.S. 1400 r in 22 days O.D. 1401 mg. hrs. radium	34 months	Progressive cat. O.D. Stationary cat. O.S.	19-25 months
2	11	Short	O.S. 3800 r in 16 days	34 months	Stationary cat. O.S.	20-28 months
3	46	Long Long Long	2000 r* in 2 days 2700 r in 4 days 2400 r* in 5 days Total 7100 r in 6 months	30 months 27 months 25 months 30 months	Normal	
4	38	Long Long Long Short	2700 r* in 7 days 2400 r* in 6 days 3000 r* in 12 days 4500 r* in 18 days Total 12600 r in 12 months	23 months 18 months 14 months 4 months 23 months	Normal	
5	59	Long Long	2400 r* in 6 days 3000 r* in 8 days Total 5400 r in 4½ months	18 months 15 months 18 months	Normal	

* Eye was protected.

tracts, or whether the radium was, solely or in conjunction with this, the contributing factor is not known. That the radium was responsible is indicated by the fact that the left eye of the second patient (case 2) received practically the same total dosage in a shorter period of time (more intense therapy) but developed only stationary opacities. The right lens in case 2 remained clear although it received a calculated indirect irradiation of 1350 roentgens because of therapy of the left lateral orbit. It seems unlikely that changes will now develop,

since the latent period for development of cataract as demonstrated by the opposite eye has passed. In these children the latent period was approximately two years.

The three adults received therapy in the ocular region but the lenses were protected in each case. From the clinical aspect alone there is little value in the observation that no lens changes have developed, but when compared with the microscopic examination of other human lenses it seems safe to assume that no opacities will develop.

Part III

Microscopic study

Histologic examination of both rabbit and human lenses was made in an attempt to determine the morphology of the pathologic process. It was hoped that this would demonstrate the tissue changes, throw light on the pathogenesis of such cataracts, and demonstrate a similarity in pathologic appearance in the two groups. Fixation of the lenses was not uniformly successful, but good material was obtained from four

rabbits of three experimental groups and four human lenses. The unirradiated rabbit eyes served as controls in the experimental study.

Rabbit I-2.

Ophthalmoscopic examination of the irradiated lens showed an aggregate of small bubbles in the posterior polar region. These were arranged in a dense opaque irregular horizontal line from

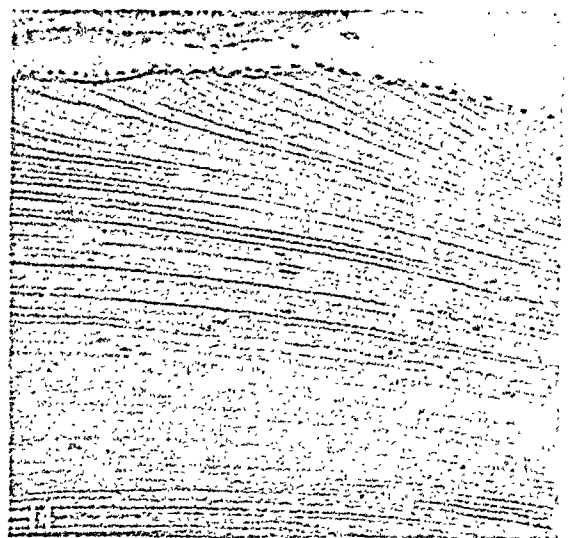
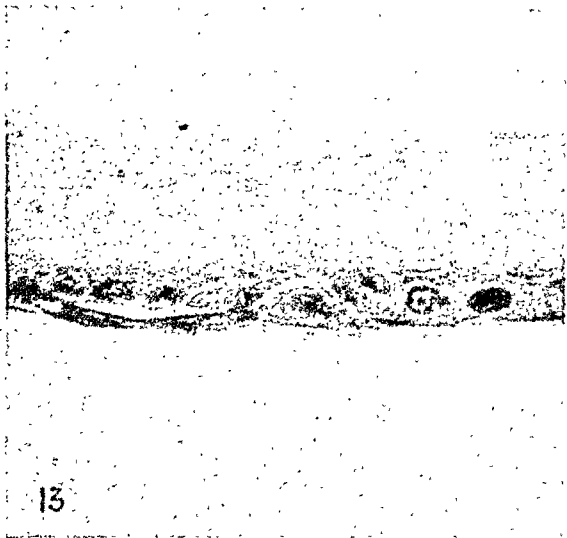
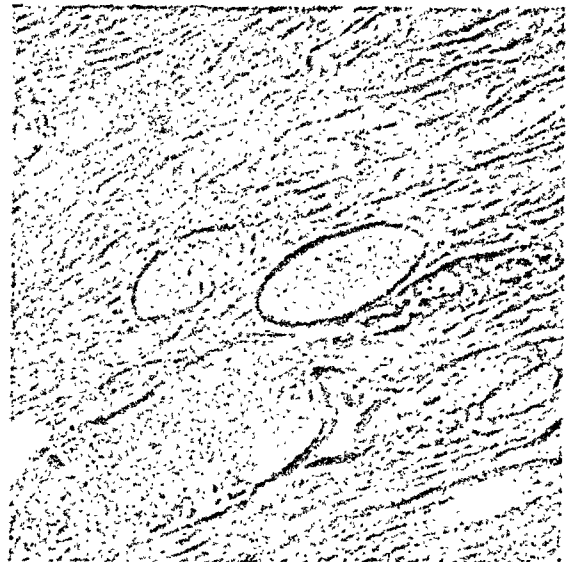
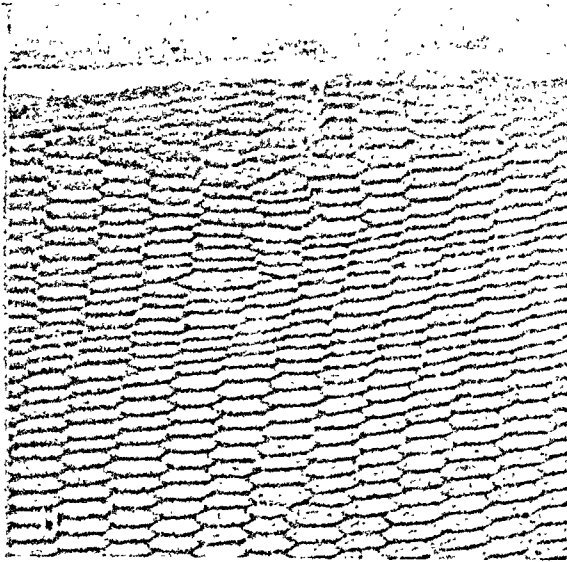


Fig. 11 (Leinfelder and Kerr). Anterior subcapsular and cortical regions. Normal rabbit.

Fig. 12 (Leinfelder and Kerr). Posterior polar region. Rabbit I-2.

Fig. 13 (Leinfelder and Kerr). Lens epithelium. Rabbit I-2.

Fig. 14 (Leinfelder and Kerr). Equatorial region. Rabbit III-2.

which radiated opacities of lesser density (fig. 1). There were also a few flocculent anterior subcapsular opacities. The eye was enucleated 23 months after irradiation.

Histologically there was pronounced swelling of the fibers at the lens bow (figs. 5 and 6). The protoplasm of these fibers was granular and they were separated by large and small vacuoles; an occasional small homogeneous globule was seen. The youngest cells, which lay beneath the capsule at the equator, were round, oval, and irregular in outline and

had completely lost the tendency to form lens fibers (fig. 7). The nuclei of these cells, as well as those of the more deeply placed injured fibers, were shriveled; however, the chromatin network was easily recognized, and some of the nuclei were degenerated. There was, in decreasing degree, an extension of the damage to the superficial fibers anteriorly and posteriorly (figs. 8 and 9). In the anterior subcapsular and cortical regions, disintegration of the swollen lens fibers was observed (figs. 10 and 11). In the posterior subcapsular region

the lens fibers were swollen and disintegrated in a thin layer continuous with the posterior extension of the equatorial changes (fig. 8). At the posterior pole degeneration extended into the cortex and in some areas small homogeneous globules were noted (fig. 12). A sharp line of demarcation existed between the pathologic and normal fibers. The entire lens epithelium was abnormal. In the anterior polar region the changes were less evident; in places the cells appeared enlarged, and the nuclei were swollen, some taking a dark stain, others appearing quite pale (fig. 13). Nearer the equator the cells were lengthened to several times normal.

Rabbit II-1.

Ophthalmoscopic examination of the pathologic lens showed a few discrete punctate opacities in the region of the posterior pole (fig. 3). Enucleation was performed 22 months after treatment.

Only the faintest evidence of pathologic change was seen under the microscope and it was with difficulty that the normal and irradiated lenses could be distinguished. Swelling of the fibers at the lens bow was apparent, especially at the anterior extremity where they were in contact with the lens epithelium. Although the posterior subcapsular fibers showed slight swelling it was no greater than that seen in normal lenses; there were a few areas of disintegrated fibers in the posterior cortex. No change was observed in the lens epithelium.

Rabbit III-2.

Ophthalmoscopic examination of the eyes before death showed a typical posterior polar opacity (fig. 1) in the irradiated eye. Enucleation occurred 20 months after treatment.

Microscopically there was a moderate degree of swelling of the fibers in the region of the lens bow (fig. 14) greatest

at the anterior extremity of the fibers (fig. 15) where they approached the lens epithelium. The nuclei of the fibers were somewhat irregular but the chromatin network appeared normal. No vacuolization was observed, and apparently normal lens fibers were being formed at the periphery. In the anterior subcapsular and cortical regions swelling and disintegration of the fibers were noted (fig. 16). The nuclei of the lens epithelium were shriveled and stained homogeneously because of disintegration of the chromatin network. In the posterior subcapsular region was a rather thick layer of degenerated and swollen lens fibers, in the midst of which there was an occasional homogeneous globule (fig. 17).

Rabbit III-3.

This rabbit received the same dosage as rabbit III-2, but the eyes were removed six months later. Examination at the time of death revealed a typical posterior subcapsular opacity in the irradiated lens. Enucleation occurred 26 months after treatment.

Moderate swelling of the lens fibers in the region of the bow was seen under the microscope. The pathologic changes in this eye were similar in almost every detail to the cataract in rabbit III-2. The lens epithelium appeared normal. There seemed to be slightly less change in the equatorial and anterior subcapsular regions, but a greater concentration of swollen, disintegrated fibers in the posterior polar region.

One lens from each of four patients who had received roentgen-ray therapy because of malignancies in the ocular region was available for study.

Case 6. C. B., a male, 46 years of age, received the following therapy for treatment of epidermoid carcinoma of the left lower lid:

August	12, '30	Left lower lid	180 K.V. 1 al. + ½ cu. filter	240 r
	13	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r
	14	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r
	16	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r
	17	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r
	18	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r
	19	Left lower lid	180 K.V. 1 al. + ½ cu. filter	120 r

September	11, '30	Left lower lid	180 K.V. 1 al. + $\frac{1}{2}$ cu. filter	240 r
	12	Left lower lid	180 K.V. 1 al. + $\frac{1}{2}$ cu. filter	240 r
	13	Left lower lid	180 K.V. 1 al. + $\frac{1}{2}$ cu. filter	240 r
October	13, '30	Left lower lid	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
	14	Left lower lid	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
	15	Left lower lid	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
	17	Left lower lid	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
	18	Left lower lid	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
December	4, '30	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	5	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	6	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	8	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	9	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	10	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	11	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	12	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	13	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	15	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	16	Left lower lid	136 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r

Total dosage, 4880 r to left eye in 4 months, but 2400 r during the last 14 days.

This eye was removed on March 30, 1931, approximately eight months after the first roentgen-ray treatment, and four months after the last series.

Histologic examination of the lens showed normal epithelium. Fixation of the lens was poor and only small portions of the subcapsular region were present. In the region of the lens bow several layers of superficial fibers appeared normal but directly underneath was a layer of thickened fibers containing a granular precipitate. In addition, layers of swollen fibers were noted immediately beneath the posterior capsule.

Case 7. R. C., a female, 75 years of age, received roentgen-ray therapy to the inner canthus of the right eye because of carcinoma.

Sept. 21, '32. Inner canthus. 130 K.V. 1 al. filter 1500 r

December 22, '32. Eye protected. 130 K.V. 1 al. filter 1000 r

February 24, '33. Inner canthus. 130 K.V. 1 al. filter 700 r

February 25, '33. Inner canthus. 130 K.V. 1 al. filter 700 r

February 27, '33. Inner canthus. 130 K.V. 1 al. filter 700 r

Total dosage received by lens, 3600 r in 5 months.

The eye was enucleated on January 11, 1935, approximately 28 months after the first roentgen-ray treatment.

Microscopic examination of the anterior subcapsular portion of the lens revealed typical thickened fibers with granular protoplasm. Beneath was a layer of normal-appearing lens fibers, but deeper than this was a second layer of swollen and disintegrated fibers. In the equatorial region the appearance was similar but in addition there was a superficial layer of normal fibers. The posterior subcapsular region was not available for study. The combined thickness of the four layers involved in the process was less than 1/10 the diameter of the lens.

Case 8. I. W., a negress, 38 years of age, received therapy in the region of the right eye because of carcinoma of the antrum.

February	5, '31	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	500 r
	9	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{2}$ cu. filter	400 r
	24	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	300 r
	25	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	300 r
	27	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	300 r
March	9, '31	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	10	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	13	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	16	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
	18	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{2}$ cu. filter	200 r
	20	Right antrum and orbit	140 K.V. 1 al. + $\frac{1}{4}$ cu. filter	200 r
April	27, '31	Right antrum and orbit	190 K.V. Thoraeus filter	200 r
	28	Right antrum and orbit	190 K.V. Thoraeus filter	200 r

May	1, '31	Right antrum and orbit	190 K.V. Thoraeus filter 200 r
	2	Right antrum and orbit	190 K.V. Thoraeus filter 200 r
	6	Right antrum and orbit	190 K.V. Thoraeus filter 200 r
	7	Right antrum and orbit	190 K.V. Thoraeus filter 200 r

Total to right lens, 4200 r in 3 months.

The orbit was exenterated September 14, 1931, seven months after the first roentgen treatment.

Microscopic examination of this lens showed changes in the region of the lens bow similar to those in the lens of rabbit III-2 (fig. 18). The pathologic fibers extended both anteriorly and pos-

teriorly, but in the latter position there was a greater degree of damage to the lens substance. The process extended quite deeply into the lens but the actual degree of injury could not be determined since the only available section had been cut superficially through the equatorial portion of the lens. The lens

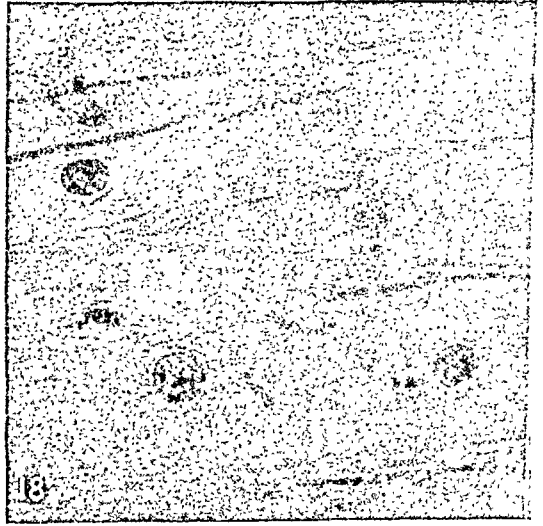
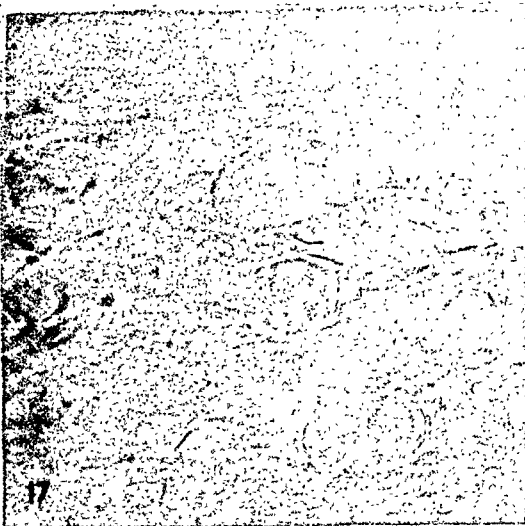
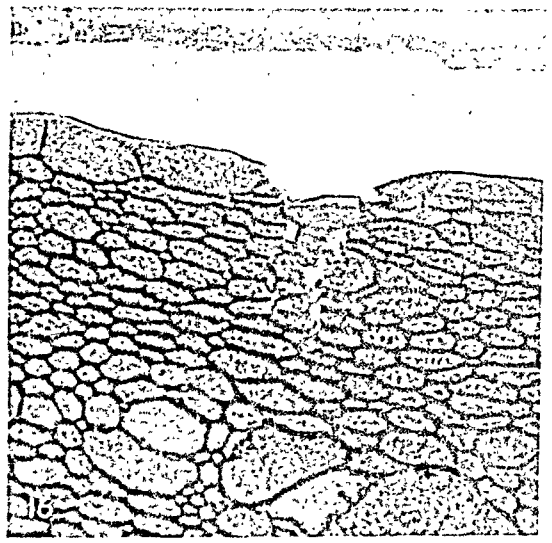


Fig. 15 (Leinfelder and Kerr). Anterior extremity of equatorial fibers. Rabbit III-2.
 Fig. 16 (Leinfelder and Kerr). Anterior subcapsular and cortical regions. Rabbit III-2.
 Fig. 17 (Leinfelder and Kerr). Posterior polar region. Rabbit III-2.
 Fig. 18 (Leinfelder and Kerr). Equatorial region. Case 8.

epithelium showed no obvious change.

Case 9. J. O., a male, 68 years of age, received roentgen-ray therapy for a malignancy of the right lower lid.

Discussion

The microscopic study of the lenses offers an explanation for the latent period in development of the opacities.

August	1, '32	Right lid	130 K.V. 1 al. filter	800 r
	3	Right lid	130 K.V. 1 al. filter	800 r
	5	Right lid	130 K.V. 1 al. filter	800 r
September	6, '32	Right lid	130 K.V. 1 al. filter	1500 r
November	10, '32	Inner canthus*	130 K.V. 1 al. filter	1000 r
May	11, '33	Right lid*	130 K.V. 1 al. filter	1500 r
August	11, '33	Inner canthus*	130 K.V. 1 al. filter	800 r
	13	Inner canthus*	130 K.V. 1 al. filter	800 r
	14	Inner canthus*	130 K.V. 1 al. filter	800 r

* The eye was protected.

Total to right eye, 3900 r in 9½ months.

Total dosage to region, 8800 r in 12½ months.

The orbit was exenterated on August 23, 1934, approximately 24 months after the first treatment.

The epithelium was normal. There were several layers of normal lens fibers beneath the capsule at the lens bow. Under these normal fibers was a layer of swollen lens elements which extended anteriorly and posteriorly where it became subcapsular.

The greatest damage to the lens fibers occurs in the region of the equator, and it is only with growth of the injured fibers to the anterior and posterior regions that opacities in the lens are visible. That the posterior subcapsular opacity is the result of growth of injured fibers is indicated by the continuation of swollen fibers from this region to the equatorial region. Where

Table 3

HISTOLOGIC RESULTS OF IRRADIATION OF RABBIT AND HUMAN EYES

Animal	Type rays	Dosage	Interval months	Opacities		
				Equatorial	A.S.C.	P.S.C.
I—2	long	2700 r in 6 days	23	++++	++	++
II—1	short	600 r in 1 day	22	+	—	+
III—2	short	3000 r in 22 days	20	++	+	++
III—3	short	3000 r in 22 days	26	+	sl.	+++

Case	Age years	Type and Dosage	Interval months	Opacities		
				Equatorial	A.S.C.	P.S.C.
6	46	Long 960 r in 8 days	8			
		720 r in 3 days	7			
		1000 r in 6 days	6			
		2400 r in 14 days	4			
		Total 4880 r in 4 mos.	8	++	?	+
7	75	Long 1500 r in 1 day	28			
		1000 r in 1 day	25			
		2100 r in 4 days	23			
		Total 3660 r in 5 mos.	28	+++	++	++
8	38	Intermediate 4220 r in 3 mos.	7	++++	?	?
9	68	Long 2400 r in 4 days	24	+	+	+
		1500 r in 1 day	23			
		Total 3900 r in 9½ mos.	24			

the anterior subcapsular and equatorial changes were pronounced (rabbit I-2) progressive changes occurred in the irradiated lens of each of the remaining rabbits of the group. It appears, therefore, that following severe injury to the lens elements there is extension into the anterior as well as the posterior portions of the lens, and that such extension indicates a progressive opacity. Lesser degrees of injury cause only a stationary posterior polar opacity.

Considering the time factor the rabbits in Group I received the largest dosage and developed the most histologic change. The dosage in Group II (600 r in a single dose) was evidently not sufficiently intense to cause more than minimal changes. In the lenses from two animals of Group III, the expected similarity in appearances was observed. The dosage was moderately severe, and in terms of roentgen units was slightly greater than group I, but the time interval was considerably greater. The microscopic changes in the lens fibers were definite, and although all three regions were involved, the amount of swelling and disintegration of lens fibers in the equatorial region was much less than in the lens of the rabbit from Group I. The posterior subcapsular change was approximately as great, however, and apparently had increased during the six-month interval between the enucleation of the two eyes. There was little evidence of the formation of normal fibers at the equator even 26 months after treatment, but it is significant that the lens epithelium in the second rabbit appeared normal while there was evidence of pathology in the epithelial cells of the first animal.

The pathologic process prevented ophthalmoscopic and slitlamp examinations of the eyes of the patients whose lenses were studied microscopically. The youngest patient (case 8) received the most treatment in the shortest period of time, and the appearances of the equatorial region of this lens were similar to that of the lens of rabbit III-2.

The histologic changes in the lens in case 7 presented two distinct but similar layers of pathologic fibers which were separated from each other by a

number of normal-appearing fibers. In addition there was a superficial normal layer at the equator. Although the lens was exposed to two series of treatment it does not seem logical to assume that the pathologic layers were the result of individual dosages 5 months apart, but the histologic picture suggests this. The extent of the pathology, although only 0.1 the diameter of the lens, was greater than would be expected from 28 months of normal lens growth in a person 75 years of age. The question of stimulation of cellular proliferation by roentgen rays has not as yet been satisfactorily answered.

The treatment in case 9 was distributed over the longest period of time. The changes were minimal, and at the equator, superficial to the changed fibers, a layer of normal lens fibers was recognized.

The lens from case 6 was obtained eight months after irradiation and from a study of the table one would expect its appearance to be similar to that in case 8. The occurrence of considerably less pathology may have been influenced by the greater age of the patient and by variation in the dosages and intervals of treatment, for 50 percent of the therapy in case 6 was given during the last two weeks of the 4-month interval. It is likely that only the last two series of treatments affected the lens, for the other dosages were small.

The lens epithelium showed no apparent change in any of the human lenses, but in rabbits I-2 and III-2 there was definite evidence of injury to the cells of this layer. In all but the former lenses, the first evidence of injury occurred at the equator, where it involved the growing fibers. That change occurred in the epithelium is indicated not alone by the fact that it was microscopically apparent in two lenses, but also by the appearance of the fibers formed following irradiation. Even at a period as late as several months after exposure of the experimental animals, pathologic fibers were still being formed in the region of the nuclear bow, and in some instances apparently from normal lens epithelium. Whether the normal-appearing fibers at the lens bow

are actually normal has not been ascertained. It is possible that the lens fibers begin their growth as normal cells, but after an interval take on the swollen characteristics of the pathologic cells.

In the experimental animals only the lens of rabbit II-1 showed evidence of the formation of normal fibers at the lens bow, yet, with the exception of case 7, the period between irradiation and enucleation was greater than in any of the human lenses. The presence of superficial normal fibers in the human lenses may be due to a difference in susceptibility of the lens epithelium, or to peculiarities in dosages of roentgen rays. The lenses showing these phenomena, however, all received therapy that was similar to that given to the rabbits. Even though in all cases the number of newly formed fibers exceeded what would be expected from normal growth of the lens, the conclusion that the pathologic fibers were the result of roentgen injury is made because of the similarity to experimental changes and the absence of comparable changes in nonirradiated lenses.

The presence of these normal fibers and the extension of the pathologic fibers to the more central posterior portion of the lens after a period as short as eight months (case 1) and the absence of advanced opacities in two years or more (cases 7 and 9) do not suggest the occurrence of progressive changes in these lenses, nor a longer latent period (two years) than was found in the children. From this observation one can assume that the three adult patients studied clinically will not develop cataracts.

The authors do not subscribe to the belief of Milner and Stallard that the lenticular damage is indirect through injury to the vessels of the ciliary body, nor do they agree with Grzedzielski,²⁰ who finds proliferation of lens epithelium along the posterior capsule. It appears, as has been noted by Okusawa,³⁰ that the lens changes result from a direct injury to the growing lens epithelium with the formation of pathologic swollen fibers that disintegrate in the posterior polar region with the production of a posterior subcapsular cataract. The histology indicates that unless the

primary injury is severe the opacity is not progressive, while the future formation of normal fibers appears probable when less intense dosages are given. There is no microscopic evidence of opacities in the nuclear portions of the lens, but that large dosages can cause disintegration of the entire lens is not denied, for both clinical and experimental studies have developed lenses with extensive changes in the deep layers.

Correlation between the behavior of the rabbit and human lenses following roentgen irradiation has been demonstrated. A similarity exists between the histologic appearance of the cataracts produced, and similar morphology was evident on ophthalmoscopic and slit-lamp observation. There is no doubt that roentgen rays will cause cataractous changes in the lens, but whether or not progressive opacification will develop seems to depend upon a number of factors. Of these the dosage and quality of roentgen rays is of primary importance. Single massive doses of long rays are the most likely to produce damage, while repeated small doses of short rays given at intervals of 4-6 times a week are less injurious. This has been pointed out by Gasteiger and Grauer¹³ who recommend treatment by repeated small doses. It is obvious that the relationship of the lens to the field treated with roentgen rays influences the possibility of cataract formation. The therapy of a more remote lesion, or one that allows protection of the eye with a lead shield should not be so dangerous as one that requires full exposure of the eye.

Conclusions

1. Nonprogressive cataract was the usual result of irradiation of the rabbit lens with ordinary therapeutic doses of roentgen rays.
2. In equal dosage short roentgen rays were better tolerated than the long.
3. Two children, after a latent period of two years, developed opacities in the lenses following roentgen-ray therapy.
4. No opacities occurred in the lenses of adults when the eye was shielded.

5. Small doses of roentgen rays did not effect the lens (case 2, right eye).

6. Nonprogressive changes consisted of a posterior polar horizontal linear opacity with radiating rows of vacuoles.

7. Microscopic examination of rabbit and human lenses showed subcapsular swelling and degeneration of lens fibers.

8. Primary injury by roentgen rays appeared to effect the lens epithelium, the cells of which subsequently formed pathologic lens fibers.

9. Early microscopic changes were seen at the equator, but with growth

the damaged fibers extended to the posterior polar region.

10. Anterior subcapsular and cortical changes indicated more severe damage that resulted in total opacity of the lens.

11. In the later stage of the nonprogressive cataract the microscopic changes were greatest at the posterior pole.

12. Clinical and histological studies indicated that progressive cataract did not invariably follow exposure of the human lens to roentgen rays.

Bibliography

- ¹ Chalupecky, H. Zentralbl. prakt. Augenh., 1897, v. 21, pp. 234 and 386.
- ² Birch-Hirschfeld, A. Arch. f. Ophth., 1900, v. 50, p. 166.
- ³ ——— Arch. f. Ophth., 1904, v. 59, p. 229.
- ⁴ Von Hippel, E. Arch. f. Ophth., 1906, v. 65, p. 326.
- ⁵ Bossuet, A. Arch. f. Augenh., 1909, v. 64, p. 277.
- ⁶ Stock, W. Klin. M. f. Augenh., 1911, v. 49, p. 93.
- ⁷ Birch-Hirschfeld, A. Quoted by Rohrschneider (11).
- ⁸ Rados, A., and Schinz, H. Arch. f. Ophth., 1922, v. 110, p. 354.
- ⁹ Stumpf, P. Arch. f. Augenh., 1921, v. 90, p. 109.
- ¹⁰ Jacoby, P. Strahlentherapie, 1924, v. 16, p. 442.
- ¹¹ Rohrschneider, W. Arch. f. Ophth., 1929, v. 122, p. 282.
- ¹² Aulamo, R. Klin. M. f. Augenh., 1931, v. 86, p. 473.
- ¹³ Gasteiger, H., and Grauer, S. Arch. f. Augenh., 1934, v. 108, p. 498.
- ¹⁴ Birch-Hirschfeld, A. Klin. M. f. Augenh., 1908, v. 46, pt. 2, p. 129.
- ¹⁵ Paton, L. Trans. Ophth. Soc. U. Kingdom, 1909, v. 29, p. 37.
- ¹⁶ Axenfeld, T. Klin. M. f. Augenh., 1915, v. 54, p. 61.
- ¹⁷ Salzer, F. München. med. Woch., 1921, v. 68, p. 203.
- ¹⁸ Horay, G. Klin. M. f. Augenh., 1922, v. 69, p. 136.
- ¹⁹ Dor, L. Ann. d'Ocul., 1923, v. 160, p. 591.
- ²⁰ Pfahler, J. A. Trans. Sec. Ophth., Amer. Med. Assoc., 1924, p. 159.
- ²¹ Salus, R. Discussion Ascher (23).
- ²² Ziegler, S. Discussion Pfahler (20).
- ²³ Ascher, K. Klin. M. f. Augenh., 1925, v. 75, p. 776.
- ²⁴ Scheerer, R. Klin. M. f. Augenh., 1925, v. 75, p. 27.
- ²⁵ Davids, H. Arch. f. Augenh., 1928, v. 99, p. 331.
- ²⁶ Meesmann, A. Klin. M. f. Augenh., 1928, v. 81, p. 259.
- ²⁷ Stallard, H. Proc. Roy. Soc. Med., 1933, v. 26, p. 59.
- ²⁸ Milner, J. Brit. Jour. Ophth., 1934, v. 18, p. 497.
- ²⁹ Grzedzielski, J. Klin. M. f. Augenh., 1935, v. 95, p. 360.
- ³⁰ Okusawa, T. Klin. M. f. Augenh., 1933, v. 92, p. 695.

Discussion. DR. THOMAS D. ALLEN: Are there not patients in whom little or no change develops? If so, is it possible to tell before treatment whether cataracts will develop?

DR. LEINFELDER: The question is rather difficult to answer, because there are so many variables that can influence what is going to happen to the patient. I believe that if the patient were to receive a small dose of Roentgen rays—e.g., 600 roentgens—with filtration of one-half millimeter copper and one millimeter aluminum, and that patient

were forty-five to sixty-five years of age, the probability of a cataract would be so remote that it need not be considered.

On the other hand, if one were to treat such a patient with 2700 or 4000 roentgens of relatively unfiltered rays, I think I would promise him a cataract. So that type of prognostication must depend on a number of factors.

DR. ALLEN: May I explain myself? There are some—even children—who have had considerable X-ray treatment and who apparently do not develop

cataract. There are others in middle life who have beginning cataract to whom considerable X-ray therapy is given without noticeable increase in the cataract.

Can we tell before giving the treatment whether the case at hand is apt to develop cataract or is apt to fall in that class which does not seem to be particularly susceptible to the X-ray?

DR. LEINFELDER: Two points are involved, I think, in the question. One is, what is the latent period for cataract formation? and the second is, will added insult act in a progressive manner after the first injury?

The latent period for children over seven apparently is two years, from the results of two cases. The latent period in adults is not determined. I believe that moderate X-ray therapy may be administered to a child who has been irradiated previously—let us say three years before—with relatively no danger of developing a cataract but there is appreciable hazard in making a prognosis.

Whether or not the patient will develop lens changes depends entirely upon the dosage and the method of ad-

ministration. If one adheres to standard filtered therapeutic doses in not too great intensity, one perhaps can avoid causing a progressive cataract.

DR. EDWARD JACKSON: Are there any observations indicating that the direction of the radiation influences its effect on the lens, whether it reaches the lens epithelium through the ciliary body or through a considerable thickness of tissue, or whether it comes directly into the pupil? Of course, the critical lens epithelium is toward the periphery of the lens.

DR. LEINFELDER: I believe I will ask Dr. Kerr to express an opinion on that—whether the direction of irradiation has any effect on the amount of roentgens that the lens gets other than a distance factor.

DR. KERR: I think, with the filtration which we try to use in these cases, which is equivalent to two millimeters of copper on the lateral orbital wall, it makes very little difference as to the intensity which the lens receives. I think it makes no difference whether the rays penetrate laterally or from the anterior.

THE MINOR SEQUELAE OF EYE CONTUSIONS

M. DAVIDSON, M.D.

NEW YORK

To test the validity of the late Henri Frenkel's notion of the anterior-segment traumatic syndrome, thirty-four consecutive eye contusions were tabulated with reference to sequelae in cornea, pupillary reflexes, iris, lens, vitreous, fundus, and visual acuity. Dehiscences of the retinal layer of the iris were found by slitlamp diaphanoscopic transillumination in the fundus reflex in half of the cases, and so frequently related topographically to the lens and peripheral fundus sequelae as to justify Frenkel's syndrome theory, and to support his thesis of the active role of the subluxated lens in the production of the syndrome. The effect of the anterior-segment lesions on visual acuity, when the media are clear, is due, however, to easily overlooked posterior-pole contrecoup lesions generally.

Perforating injuries of the globe and their late complications—retinal detachments, cataracts, and phthisis bulbi—present no medico-legal problems in workmen's compensation. Severe contusions of the globe with marked hyphema, hemophthalmos, and corneal and scleral ruptures are hardly ever untreated or subject to controversy. Neither is the traumatic origin of the major sequelae of such contusions, such as sphincter tears, iridodialysis, lens subluxations, vitreous prolapse, choroidal ruptures, retinitis proliferans, and retinal detachments, often disputed. Minor eye contusions, often masked by the more superficial lid, conjunctival, and corneal lesions, and occasionally untreated altogether, or not referred by the general practitioner to an ophthalmologist in their early stages, now and again give rise to medico-legal problems. The major sequelae are amply dealt with in textbooks and special monographs dealing with eye injuries, notably in the classical treatises by Praun,¹ Maitland Ramsey,² Wagenmann,³ Birkhäuser,⁴ and Würdemann.⁵ Our knowledge of the minor sequelae on the other hand is recent and dates only from the wider experience of the World War and particularly from the introduction of the slitlamp.

References to the minor sequelae are scattered in the literature accumulated since then, and monographs and atlases dealing with war injuries and slitlamp microscopy, notably those of Lagrange,⁶ von Szily,⁷ Vogt,⁸ Koeppe,⁹ the French Society of Ophthalmology,¹⁰ and Koby.¹¹ They have not found their way into textbooks and are therefore not widely known. The only systematic

attempt to deal with these minor sequelae, but without utilization of slitlamp findings, was made by the late Henri Frenkel^{12, 13, 14} during and after the War in several papers in the development of his notion of the anterior-segment traumatic syndrome.

The large number of eye injuries examined at the New York State Department of Labor, Bureau of Workmen's Compensation, offered the writer an opportunity to make a study of the minor sequelae of eye contusions and special attention was devoted during the whole year of 1935 to this subject. Since the depression and the application of more adequate safety measures, the average annual number of eyes examined at New York City has decreased but it still amounts to about 2,700. Intraocular pathology is exhibited by 15 percent of which a third are due to contusions. It is therefore a major item in medico-legal ophthalmology.

In order to gain a clear picture of the minor eye contusions and their sequelae, of the frequency of the various sequelae, of their relation to visual acuity, and of the validity of Frenkel's notion of the anterior-segment traumatic syndrome, 34 cases were selected for tabulation. The major eye contusions—those with enucleation, or phthisis bulbi or total traumatic cataract as end result—and the indirect eye contusions leading to detachments—for instance, which occur in eyes predisposed by previous disease or injury—some incomplete cases, and pure posterior-segment cases were left out of consideration.

The attending ophthalmologist's re-

Table 1
EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Number, Occupation, and Name	Age	Date of Accident	Eye	Accident	Injury	Last Date of Bureau Examin.
1 Janitor DeG. J.	57	3/ 4/35	O.D.	While looking up dumb-waiter shaft, piece of wood struck right eye.	Vitreous hemorrhage, hyphemia, sublux. lens, "light area upper temp. sclera seen by transill."	12/26/35
2 Polisher C. S.	40	2/ 3/34	O.S.	Die struck left eye	Upperlid laceration and intraocular hemorrhage	8/ 9/35
3 Carpenter Z. J.	34	3/26/34	O.D.	Brass struck right eye	Chemosis	9/26/34
4 Foreman R. D.	?	8/30/34	O.S.	Sewing-machine belt snapped and struck left eye	Hematoma of lids, sphincter tears, iridodonesis	3/15/35
5 Saw Worker J. M.	21	8/16/34	O.D.	Saw broke and cut over right eye	Laceration over right eyebrow and malar bone, hyphemia	11/21/35
6 Carpenter A. A.	36	11/26/35	O.D.	Nail struck right eye	Contusion left eye	2/27/36
7 Brush Capper V. A.	35	11/ 5/34	O.S.	Struck by piece of wire	Abrasion cornea	1/ 3/35
8 Social Worker S. W. A.	39	6/23/24	O.S.	Block of wood in sawing careened back from ground and struck left eye, breaking glass	Laceration around orbit and unconscious	3/13/35
9 Carpenter M. A.	50	3/11/35	O.S.	Nail flew up while hammering, and struck left eye	Erosion cornea, Desce-met's folds, aqueous cloudy	1/ 3/36
10 Laborer C. J.	43	2/ 2/33	O.D.	Stone struck right eye while hammering	?	10/23/35
11 Hack driver McA. A.	40	9/12/35	O.D.	Thrown from taxi to road	Laceration right face, skull fracture (?), ecchymosis of lids, peripheral facial paralysis, infection	2/21/36
12 Hack driver A. P.	35	11/27/33	O.D.	Struck right eye and nose in altercation with fellow worker	Right eye: Ecchymosis, subconjunctival hemorrhage, hyphemia, iritis Left eye: Ecchymosis	2/19/36

Table 1

EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Cornea	Pupil Larger, Deformed, and Paretic	Iris Trans- illumination and Sphincter Involvement	Lens Opacities and Sub- luxation	Anterior Vitreous Pigment Particles	Fundus Lesions	Visual Acuity, End Result	Remarks
—	+	Radial at "6 o'clock," sphincter intact	Axial, ante- rior capsular and sublux- ation	+	Not clear	20/50	Wooden sliver sub- conj. upper tempor.
—	+	Upper nasal and upper temporal transill.	Sublux.	+	Upper temp. pigmented chorio-ret. scar	20/20-4	
—	+	Upper tem- poral root transill.	Upper tempor. small opacity	+	Upper temp. pigm. chorio- retin. scar	20/20-	
—	+	Border of pu- pil notched at "6 o'clock"	Axial, small anterior cap- sular	+	Lower pe- ripher. pigm. chorio-ret. scar	20/20	
—	+ Slightly	Multiple ra- dial tem- poral trans- ill.	Temporal, faint ante- rior capsular op.	+	Temporal pig- mented chorio- ret. scarring	20/40	Metamor- phopsia
—	+	Upper nasal iridodialysis	Nasal ante- rior capsular op.	+ On pro- lapsed vitreous nasally	—	20/33	Refraction: —3.50 D. cyl. ax. 30°
—	+	Extensive lower quadr. transillum.	—		Lower temp. peripheral chorio-ret. scarring	20/20	
—	+	Radial and parallel transill. in several quad.	—	+	Upper temp. disinsertion and total de- tachment	No L.P.	—13 D. myopia
—	+ Irido- donesis	Upper temp. transill.	Axial, scat- ter. anter. capsular op.	+ On upper temp. pro- lapse	Not clear	20/66	
—	+	—	Anterior cap- sular op. at "12 o'clock"	+	Normal	20/20	
—	+	Upper temp. pupil border notched, no transill.	Anter. and post. capsular temp. op.	+	Irregular lower temp. fluffy chorio-ret. pigm. lesion	20/200	
—	Larger but round	No transill.	—	+	Parallel equato- rial ret. tear below, 6 disc d. in length and 1 across	20/20-2	Unchanged under 2½ years' ob- servation

Table 1

EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Number, Occupation, and Name	Age	Date of Accident	Eye	Accident	Injury	Last Date of Bureau Exam.
13 ? K. O.	?	?	O.D.	Knife jumped and cut right eye	Laceration through entire thickness of upper lid at middle	12/18/35
14 Cafet. worker S. W.	27	4/16/34	O.D.	Cork of beer barrel struck right eye	"Black eye only, no injury to globe, zonular cataract and myopia" observed 11 days later	1/ 7/35
15 Electrician G. J.	48	8/16/34	O.D.	Pipe struck right eye	No data	10/31/34
16 Auto mechanic G. R.	34	4/19/35	O.D.	Struck right eye by pipe on putting on belt	Laceration upper lid	9/ 3/35
17 Salesman S. J.	27	1/25/35	O.S.	Struck by branch of tree	Laceration upper left and right lids, hyphemia left	5/3/35
18 ? S. N.	53	8/31/34	O.S.	Hook struck left eye	Hyphemia	10/11/35
19 Stone-cutter McB.	53	6/ 2/34	O.S.	Struck by stone	Contusion	2/ 7/36
20 Mechanic B. N.	25	7/26/34	O.S.	Left eye struck by water from twisted hose	Chemosis, ecchymosis, for. b.'s in conj., hyphemia, sph. tear	?
21 Rock exc. N. T.	50	7/15/35	O.D.	Struck by stone	Corneal abrasion	11/23/35
22 Cab. mak. F. A.	21	12/22/34	O.S.	Struck by nail	Vitreous hemorrhage, iridodialysis	2/19/35
23 Stevedore S. P.	49	11/19/34	O.S.	Piece of wood struck left eye	Hyphemia	4/24/35
24 Tailor L. Y.	46	8/23/35	O.S.	Sewing-machine belt broke and struck left eye	Laceration of cornea	12/30/35

Table 1

EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Cornea	Pupil Larger, Deformed, and Paretic	Iris Trans- illumination and Sphincter Involvement	Lens Opacities and Sub- luxation	Anterior Vitreous Pigment Particles	Fundus Lesions	Visual Acuity, End Result	Remarks
—	+	No transill.	Temporal coronary op.	+	Extensive pe- ripheral temporal pig- mented chorio- ret. scar	20/20	See Vogt, ^a vol. 2, for similar case
—	Normal	No transill.	Anterior and post. capsu- lar op. and pe- ripheral riders	—	—	20/40	1926, 1972 and 1929 Swiss Army records of 20/20 O.U. Refr. incr. from -2D. to -3.5D. under obs.
—	+	Sphincter tears, no transill.	Sublux.	+	—	Varies between 20/25 and 20/100	
—	+	Upper temp. and upper nasal trans- ill.	Upper temp. and upper nasal ant. capsular op.	—	—	20/20-3	
—	+	Sphincter tear below	Sublux., anter. ax. capsular op.	—	—	20/20	
—	+	Temp. and nasal root transill.	Anterior and post. cap- sular op.	—	— Not clear	20/100	
No deposit of pigm. on Desc.	+	No transill., iridodonesis below	Anterior and post. capsu- lar op.	+ On prolapse from below filling pupil	—	20/40	
—	+	Extens. lower quadr. transill.	—	—	—	20/20	
—	+	Temp. root transill.	—	—	—	20/20	
—	+	Lower nasal root transill.	—	—	—	20/20	
Lower tempor. radial scars	+	Lower temp. radial trans- ill.	—	Bilat. non- pigm.	—	20/40	
Perfor., tempor. scars	Normal	No transill.	Small tem- poral ant. capsular op.	+	—	20/20	

Table 1

EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Number, Occupation, and Name	Age	Date of Accident	Eye	Accident	Injury	Last Date of Bureau Examin.
25 Garage worker M. J.	25	2/ 7/34	O.S.	Held up and struck on head with lead pipe	Laceration of forehead, brain concussion, black left eye	1/20/35
26 Oil burner A. L.	28	10/20/34	O.D.	Explosion of tank while giving oil test	Numerous subconj. for. b.'s in right eye	?
27 Milkman A. B.	27	8/27/35	O.S.	Rubber belt struck left eye	No injury, high myopia	10/ 2/35

EYE CONTUSIONS WITH ANTERIOR- AND POSTERIOR-SEGMENT INVOLVEMENT

28 Carpenter S. S.	38	9/13/34	O.D.	Piece of wood struck right eye	Laceration of upper lid, intraocular hemorrhage	1/23/35
29 Assembler H. J.	34	2/19/35	O.S.	Air-gun piston struck left eye	Laceration of left eye-brow and hemophthalmos	2/21/36
30 Auto mechanic S. N.	29	8/ 1/33	O.D.	Hood splinter struck right eye	Iridodialysis	?
31 Laborer F. W.	18	7/ 9/34	O.S.	Steamhose exploded in face	Ciliary injection, cornea studded with deposits, posterior-lens op., choroid. lesion	10/29/35
32 Helper D. J.	46	9/21/35	O.D.	Water from high-pressure hose struck right eye	Hyphemia and hypertension	11/ 6/35
33 Street cleaner G. C.	45	3/29/34	O.S.	Struck by flying ball	Vitreous hemorrhage, subluxated lens	?
34 Laborer S.O.	24	4/20/34	O.S.	Piece of drill struck left eye	Contusion. Not seen until 2 months later	6/15/35

Table 1

EYE CONTUSIONS WITH ANTERIOR-SEGMENT INVOLVEMENT

Cornea	Pupil Larger, Deformed, and Paretic	Iris Trans- illumination and Sphincter Involvement	Lens Opacities and Sub- luxation	Anterior Vitreous Pigment Particles	Fundus Lesions	Visual Acuity, End Result	Remarks
—	Normal	No transill.	Axial anterior capsular op. and vacuoles	+	—	20/50	Refraction: increase from —1D. to —5D. under obs.
—	+	Lower temp. transillum.	—	—		20/20	
—	Normal	Normal	—	—	Extensive lower temp. Pigm. chorio-ret. lesion with macular edema	20/40	

EYE CONTUSIONS WITH ANTERIOR- AND POSTERIOR-SEGMENT INVOLVEMENT

—	+	Normal	Upper nas. anterior capsular op.	+	Pigmentation of fovea-punctate	20/20-2	
—	+	Radial transill. at "12 o'clock." Sphincter intact	—	+ Disappeared in 1 year	Irregular chorioid rupt. between disc and fovea		Refraction: —1.5D. cyl. ax.180°
—	+	Lower temp. iridodialysis	—	—	Lower temp. disinsertion, chorioid. rupture, macular hole, and detachm.	20/200	
—	+	Temporal half of root transill.	—	—	Macular and upper juxta-papillary chorio-ret. pigm. scarring	20/40	
—	+	Numerous sphincter ruptures	Posterior beaten-silver op.	—	Punctate foveal pigment	20/20	
—	+	Normal	—	+	Punctate temporal parafoveal pigment	20/100	
Pigm. on Desc.	Round	—	—	Non-pig. opacities	Lower nasal ret. hole with lid attached	20/30	

ports and C-5 forms contain rarely more than summary diagnoses, such as contusion, or the principal findings and sequelae, such as hyphemia, intraocular hemorrhage, iridodialysis, lens subluxation, or detachment. These are found under "Injury" in tables. The cases are seen months and sometimes years after the injury and the observations of the sequelae are those of the writer.

Slitlamp diapupillary iris transillumination in fundus reflex

While all anterior-segment findings recorded are those with slitlamp and microscope, transillumination of the iris (diaphanoscopy or retroillumination) by the diapupillary method with slitlamp and unaided eye in the fundus reflex was found more satisfactory. The brightness of the fundus reflex, seen in the pupil or in any other adventitious defect in the iris (iridodialysis for instance) is much reduced when examined with the microscope, because of the magnification, wide angle between incidence and observation and light absorption. If one wishes, therefore, to secure a maximum brightness of the fundus reflex in looking for iris translucencies, one has to dispense with the microscope and employ the diapupillary method. That it is the fundus reflex which makes transillumination of the iris or the anterior segment in general possible and not, as is often stated in books on slitlamp microscopy, reflection from the lens, is obvious from the fact that the translucent areas are red and are always described as red and glowing, regardless of whether the lens is cataractous or not and whether the iris defect is confined to the pigment layer or traverses the entire thickness. It is only in transillumination of the pupillary border of the iris that reflection from the lens comes into play and the translucent border is then not red.

Insistence on the use of the microscope has apparently distracted attention from the possibilities of the high intensity of the slitlamp beam for anterior-segment transillumination and particularly for diapupillary transillumination of the iris. No references, ex-

cept an occasional discouraging one, are found in the writings of Koby, Graves,¹⁵ Butler,¹⁶ Koeppe, Vogt, and Mawas¹⁷ to diapupillary transillumination, and diascleral illumination has been found much inferior by the writer.

The procedure employed in bringing out even the minutest depigmentations of the iris has been to face the observed eye at a distance of about 25 cm. and direct the slitlamp beam into the pupil at as small an angle with the visual axis of the observed eye as possible. The latter is secured by having the slitlamp arm as close as possible to the observer's head and using a 100-mm. illuminating lens instead of a 70-mm. lens. The maximum intensity is secured by focusing the beam for the plane of the pupil. The beam then occupies only a small portion of the pupil, the free portion giving a fundus reflex. An overloaded slitlamp is necessary to secure the requisite intensity and the observer's light sense should be enhanced by dark adaptation. A small pupil is preferable in looking for defects which may disappear in the iris folds. The visibility of the iris defects seems little affected by the direction of the beam; that is, whether it is directed to the same or to the opposite side of the sector involved.

The cases tabulated were studied with particular reference to findings in the cornea, pupil, iris, lens, vitreous, and fundus periphery and fovea and to changes in refraction attributable to contusion. They are tabulated as those with anterior-segment involvement only and those with anterior- and posterior-segment involvement.

Cornea

Brown deposits on Descemet's membrane have been noted only once. Their frequent presence in iritis and uveitis, particularly chronic and in the senile, and comparative rarity in contusions as a sequel have acquired the significance of a differential diagnostic sign. It does not appear to form part of the contusion syndrome as a sequel, except, of course, in the presence of a complicating uveitis. This lack of attraction of Descemet's membrane for pigment

deposits in the pure contusions is strikingly illustrated in the cases in which a prolapsed vitreous projects like a mushroom half way into the anterior chamber and is densely peppered with pigment particles without the slightest tendency on the part of any of them to land on Descemet's membrane (cases 6, 9, 19.) When present, they are smaller, darker in color, and not at all like those in size and color seen in the vitreous, whether prolapsed or remaining retrolenticular, and suggest as their origin pigment-laden phagocytes rather than retinal (iridic or ciliary-body) pigment. The occasional corneal scarrings incident to the accompanying erosion or laceration is obviously not part of the contusion per se.

Pupil

Traumatic mydriasis is the most frequent of the sequels of eye contusions. The pupil, however, is not simply irregular but most commonly D-shaped; that is, with a chord replacing the arc in a sector, similar to that in iridodialysis. It is sluggish in direct and consensual reaction to light and in convergence. It reacts poorly to mydriatics and miotics in the sector corresponding to the "chord" border and can hardly therefore, be described as or confounded with an Argyll Robertson pupil. Because sphincter tears are rare, minute when present, and, as seen with the slitlamp, present mainly a dispersion of pupillary-border pigment, the term paralytic mydriasis is misleading. Traumatic iridoplegia, since both sphincter and dilator are involved, would best describe the pupil. Its presence indicates an anterior-segment involvement, since in pure posterior-pole involvement it is met with much more rarely and there is rarely deformation. It was found in 85 percent of this series.

Iris

Dehiscences of the iris pigment layer, manifested by transillumination particularly in the sector corresponding to the "chord" of the deformed pupillary border, is another very frequent sequel. Wagenmann referred to it as having been observed and described by Pohl-

enz in 1891, presumed that it is more often present but easily overlooked, and remarked that it is not visible with the ophthalmoscope but is to be detected by focal retroillumination. Frenkel also referred to its frequency. Graves in 1929 called further attention to dehiscence of the retinal pigment layer of the iris and suggested the name of epidialysis. Koby¹⁰, Mawas¹⁷, Vogt⁸, Cattaneo¹⁸ and Vannas¹⁹ also called attention to it. Vannas referred to it as diastasis or rupture of the pigment layer. What we are dealing with is simply an incomplete rudimentary iridodialysis with all the features belonging to it. The paresis of the dilator suggests that both the retinal and dilator layers are involved. The dehiscences are either single or multiple, confluent, round or irregular iris-root lesions corresponding to Fuchs's peripheral dark zone, where the iris is thinnest. Occasionally they are radial without involving the sphincter. Together with the characteristic pupil the evidence for an eye contusion involving the anterior-eye segment from iris root to transillumination is incontrovertible. Iris lesions are present in 50 percent of all cases including iridodialysis and notching of the pupillary border, with only 15 percent of sphincter tears so-called.

Other conditions in which iris transillumination occurs are to be borne in mind:

1. In cataracts, glaucoma, and senility the pigment border is often depigmented, but not the root, and there may be diffuse depigmentation of the lower iris sector, generally bilateral.

2. In the blue eyed, even in the young, there is the same diffuse translucency, more marked below and also bilateral.

3. In iritis and uveitis there is depigmentation of the pigment border and some translucency of the iris after rupture of the synechiae by mydriatics, but these are always obvious conditions and accompanied almost always by pigmented deposits on Descemet's membrane.

4. In mesodermal atrophy and anterior synechiae there is also translucency of the iris but the sharply out-

lined shrinking of the iris tissue and the synechiae are too obvious to lead to difficulty (Waite²⁰).

5. It has been described, but not observed by the writer, in the following conditions: diabetes, retinitis pigmentosa, Horner's syndrome, after infectious diseases (chicken pox, Löwenstein²¹), in experimental herpes, sympathetic ophthalmia, in Argyll Robertson pupils, and in xeroderma pigmentosum.

6. In myopia, translucency has been found by the writer mainly below and radial and related to peripheral chorioretinal lesions. Obviously the same findings are found in detachments in myopic subjects, and, when observed, it is a problem as to whether the myopia or the contusion is responsible for these iris depigmentations.

7. Finally, it is observed in post-operative cases, after cataract extractions, for instance, which are after all traumas.

The list of conditions from which a differential diagnosis has to be made seems rather large. Most of the patients seen in compensation practice, however, rarely have cases complicated by these problems, being preponderantly healthy males between the ages of 20 and 45 years, among whom most of these conditions are not frequent enough to give trouble.

Lens

Contusion opacities of the lens may be conveniently classified into the transient posterior cortical, permanent anterior, permanent posterior capsular (beaten silver) opacities, equatorial "riders," coronary opacities, and the late anterior cortical rosette and the late total traumatic cataract. Vossius's ring, following a hyphemia has been reported only once (not in this series) and when seen 3 months later had left only faint traces in the form of a few round epicapsular lens deposits with clear centers. Its rarity and disappearance and the clearing of the centers of deposits would argue against the explanation by Vogt of its being an imprint of the iris crushed against the lens and rather support the thesis of Hesse²² and Zentmayer²³ that it repre-

sents a thin layer of blood on the lens capsule. The most frequently observed lesion is the small, tenuous, somewhat striated anterior subcapsular opacity, permanent and stationary, very often hidden under the iris, even in the larger posttraumatic iridoplegias, and so superficial at times as to suggest an involvement of the capsular zonular lamellae only, particularly when peripheral. The lens opacities almost always correspond to the depigmented iris sectors. This is also the sector where the iridodonesis indicates a backward displacement of the lens, as evidenced by the vitreous prolapse. The anterior chamber is also shallower in the same sector. The pressure of the vitreous and its mobility would seem a better explanation of the iridodonesis than the lack of support of the lens. Lens lesions (opacities and subluxations) were noted in 60 percent of the cases. In case 6, refraction changes seem directly related to desubluxation with myopic astigmatism as a result. Note also case 29 in which myopic astigmatism may be the result of a subluxation. Cases 14 and 25 show increase of the myopic refraction accompanying lens changes.

Vitreous

The retrolenticular pigment particles seen after contusions are rather large and bright red, and easily distinguished from the smaller, dull-brown granules seen after vitreous hemorrhage from whatever cause—trauma or disease—which are in color and size more like those seen on Descemet's membrane in uveitis and in the senile. Vogt²⁴ first described them as "strikingly large bright red and brown particles in the vitreous and mobilized in large quantities in the anterior chamber after an unsuccessful attempt at magnet extraction of an iron particle in the ora serrata." Jeandelize²⁵ reported a similar observation after an unsuccessful attempt at extraction of an iron particle from the ciliary body. Koby on the other hand said, "To classify vitreous opacities by their color is useless. . . . One observer will describe them as reddish, another as yellowish brownish."

Kirby²⁶ describes them as "lusterful reddish brown granules" which he has observed "in detachment of the retina and obviously coming from the retinal pigment epithelium and after a contusion." To one who has seen them a few times, their bright-red color and large size are characteristic. The writer has often wondered about the noncommittal term "particles" or "granules." Since the same particles seen in the retrolenticular vitreous are those seen enmeshed in it when the vitreous has prolapsed into the anterior chamber, and their source can be only the pigment epithelium from the retina (as in detachment), ciliary body, or iris, there seems to be no good reason for not calling them plainly retinal pigment. Their presence is one of the common phenomena in contusions—occurring in 56 percent of the cases.

Fundus

At two vulnerable points minor sequelae are often noted: in the fundal periphery and at the fovea. In both situations they are frequently overlooked if indirect ophthalmoscopy is not used. The major posterior-segment lesions, the holes in the macula, and the choroidal ruptures have often been described and are familiar. The minor foveal whitish or pigment stippling and the parafoveal yellowish or slightly pigmented small patches, presumably remains of a Berlin's opacity—a disturbed continuity of the macular reflex and best seen in indirect ophthalmoscopy, suggestive of level changes—are often compatible with 20/20 vision and therefore not searched for. They may be regarded as contrecoup lesions complicating the anterior-segment traumatic syndrome of this series, rather than direct in the type of injury with which we are dealing. Their frequent observation leads the writer to conclude that the occasional subnormal vision obtaining in eye contusions with alleged normal fundus observed by Frenkel and others, probably represents minor foveal lesions overlooked.

References to the peripheral traumatic lesions are strangely scarce in textbooks and the literature. A recent

casual reference; therefore, is worthy of being quoted. Kirby wrote (loc. cit.): "After a contusion observed months after injury critical ophthalmoscopic examination revealed in the periphery an area of the retina with pigment similar to those seen about a tear." The condition often observed simulates what is regarded as an anterior-chorioretinitic manifestation of congenital or acquired lues, or an atypical retinitis-pigmentosa lesion, the lesions seen in myopia, after extraction of intraocular foreign bodies by the posterior route, and after detachment operations, and has been found in 58 percent of the cases.

Conclusions

A study of 34 eye contusions and an analysis of the sequelae show a prevailing concomitance of two to six lesions, obviously anatomically related to each other, and stretching from the iris root, along the lens equator, zonule, ciliary body, ora serrata, and vitreous to justify the notion of the anterior-segment traumatic syndrome described by Henri Frenkel. This is of medico-legal importance in the presence of a lesion in the anterior segment. The question then ceases to be whether it is related to a contusion, but rather concerns itself with the existence of an anterior-segment contusion syndrome. *Testis unus, testis nullus*, as Frenkel suggested, becomes a reasonable guide.

From a study of sequelae alone, no conclusions can be drawn as to the mechanism of contusion, namely as to whether the lens is an active agent in the production of the syndrome, as Frenkel taught, expressing it by saying that the lens distends the iris as the "fetus distends the uterine cervix." The classical Arlt teaching of the widening of the corneoscleral ring as the main factor, and recently revived by Gradle,²⁷ would seem to the writer to rest too much on the purely mechanical hydrodynamic notion of the eye as a bag containing an almost incompressible fluid transmitting pressure applied to it equally in all directions. This

is out of keeping with the experiences of the World War, which have acquainted us with indirect eye lesions, by concussion or commotion (Lagrange,⁶ von Szily,⁷ Ammann,²⁸ Gallois,²⁹ Brueckner,³⁰ Davidson³¹), with the results of a world-wide preoccupation with detachment of the retina, leading to recognition of sudden eye movements in relation to vitreous mass movements and zonule tractions, in its genesis (Lindner,³² Arruga,³³ Csapody,³⁴ Vogt⁸); and with reports of iridodialysis from a flash of strong light (Mandicevski³⁵). Wagenmann as early as 1915 admitted that with the classical approach the subject is far from closed. The postwar current notion is best expressed by Vogt, who likens the effects of eye contusion to those of brain concussion, where the notion of compression is secondary. He resorts to the term *Schleuderbewegung*; that is, of the relative movement of constituent parts against each other: of the heavier against the lighter ones; of the iris against the lens, producing Vossius's ring, lens against vitreous making for subluxations, vitreous against retina for macular hole, and retina against choroid for Berlin's opacity. Frenkel's notion of the displacement backward and rebound of the lens on an equatorial axis is more in keeping with these more modern views, and is supported by slitlamp observation.

Some problems in the mechanism still require further study. There is the

visceral factor, namely, the state of a living functioning organ at the time of the injury: the state of the pupil; the state of accommodation; that of tension, as well as the various reflexes: lid closure reflex (Gradle²⁷), reflex hypotony (Greenwood³⁶), and vasomotor reflex (Gallois²⁹). It would seem reasonable to expect a different response in eyes with tense zonule or advancing vitreous from that in eyes with retreating vitreous or relaxed zonule in relation to accommodation. Occasionally, in perforating injuries of the cornea, the lens capsule is injured at a point near the equator, the perforation not passing through the iris, indicating that the iris had gotten out of the way; that is, that mydriasis occurs equally with miosis in eye injuries.

The anterior-segment traumatic syndrome is much more common than the posterior-segment traumatic syndrome, which has been observed only ten times in the same period of observation as the injuries reported in this series, and is not often complicated by posterior-pole lesions, found only in about 20 percent of cases.

While traumatic iridoplegia is the most easily demonstrated lesion, the others have to be looked for. Their observation in about half of all cases, although in varying combinations, indicates that if they were more carefully searched out they would probably be found even more frequently.

80 Center Street.

References

- ¹ Praun. *Die Verletzungen des Auges*. Wiesbaden, Bergmann, 1899.
- ² Ramsey, M. *Eye injuries and their treatment*. Glasgow, J. Maclehose & Sons, 1907.
- ³ Wagenmann, A. *Die Verletzungen des Auges, etc.* Graefe-Saemisch Handbuch der gesamten Augenheilkunde. Ed. 3, 1915-1925, v. 1, p. 470.
- ⁴ Birkhäuser, R. *Ueber die Schädigungen des menschlichen Sehorganes*. Bern, A. Francke, 1910.
- ⁵ Würdemann, H. V. *Injuries of the eye*. Ed. 2, St. Louis, C. V. Mosby & Co., 1932.
- ⁶ Lagrange. *Atlas d'ophtalmoscopie de la guerre*. Paris, Masson et Cie, 1918.
- ⁷ Von Szily. *Atlas der Kriegsaugenheilkunde*. Stuttgart, Enke, 1919.
- ⁸ Vogt, A. *Atlas der Spaltlampenmikroskopie*. Ed. 2, Berlin, Springer, 1931.
- ⁹ Koeppe, L. *Die Mikroskopie des lebenden Auges*. Bern, E. Bircher, 1921.
- ¹⁰ Kobay, F. E. *Biomicroscopie de l'oeil vivant*. Soc. Franç. d'Opht., Paris, Masson et Cie, 1926-1932.
- ¹¹ ———. *Slitlamp microscopy of the living eye*. Ed. 2, Philadelphia, P. Blakiston's Son & Co., 1929, p. 670.
- ¹² Frenkel, H. *Sur la valeur medico-legale du syndrome traumatique du segment antérieur*. Arch. d'Opht., 1931, v. 48, Jan., p. 5.
- ¹³ ———. *Sur la cataracte annulaire par contusion de Vossius*. Arch. d'Opht., 1932, v. 49, July, p. 431.

- ¹⁴ ———, and Dejean, C. Etude anatomique, étiologique, expérimentale et clinique de la rupture et de l'arrachement de la zonule. *Arch. d'Opht.*, 1932, v. 49, December.
- ¹⁵ Graves. *Trans. Ophth. Soc. U. Kingdom*, 1925. *Amer. Jour. Ophth.*, 1929, v. 12, Aug., p. 670.
- ¹⁶ Butler. *Brit. Jour. Ophth.*, 1924, December.
- ¹⁷ Mawas, J. Biomicroscopie de la chambre antérieure de l'iris et du corps ciliaire. Paris, Masson et Cie, 1928.
- ¹⁸ Cattaneo, D. Injuries of posterior iris layer. *Ann. Ottal.*, 1929, v. 58, p. 11.
- ¹⁹ Vannas, M. Klinische und experimentelle Untersuchungen über Pigmentveränderungen bei einigen Augenkrankheiten, etc. *Arch. f. Augenh.*, 1932, v. 106, p. 1.
- ²⁰ Waite. Essential progressive atrophy of the iris. *Amer. Jour. Ophth.*, 1928, v. 11, p. 187.
- ²¹ Löwenstein, A. Vitiligo iridis. *Klin. M. f. Augenh.*, 1932, v. 89, p. 790.
- ²² Hesse. *Zeit. f. Ophth.*, 1918, v. 39, p. 195.
- ²³ Zentmayer. *Trans. Ophth. Soc. U. Kingdom*, 1925.
- ²⁴ Vogt, A. Siderosis bulbi am Spaltlampenmikroskop. *Klin. M. f. Augenh.*, 1921, v. 66, p. 273.
- ²⁵ Jeandelize and Gault. Un signe biomicroscopique du corps étranger intraoculaire de la région ciliaire. *Bull. de la Soc. d'Opht. de l'Est de la France*, 1932, Jan.
- ²⁶ Kirby, D. The anterior vitreous in health and disease. *Arch. of Ophth.*, 1932, v. 7, p. 241.
- ²⁷ Gradle, H. S. Rupture of the sphincter portion of the iris produced by blunt trauma. *Arch. of Ophth.*, 1934, v. 11, Jan., p. 92.
- ²⁸ Ammann, E. *Klin. M. f. Augenh.*, 1919, v. 63, p. 80.
- ²⁹ Gallois, J. Essai de classification des décollements traumatiques pures. *Ann. d'Ocul.*, 1929, v. 166.
- ³⁰ Brueckner, A. Zur Frage der indirekten traumatischen Netzhautabhebung. *Zeit. f. Augenh.*, 1919, v. 41, p. 255.
- ³¹ Davidson, M. Indirect traumatic detachments. *Proceedings XIV. Intern. Congr. Ophth.*, 1933.
- ³² Lindner. Prevention of spontaneous retinal detachment. *Arch. of Ophth.*, 1934, v. 11, Jan., p. 148.
- ³³ Arruga. *Proceedings XIV. Intern. Congress Ophth.*, 1933.
- ³⁴ Csapody, J. *Klin. M. f. Augenh.*, 1932, v. 88, June, p. 783.
- ³⁵ Mandicevski, C. *Klin. M. f. Augenh.*, 1935, v. 94, May, p. 668.
- ³⁶ Greenwood, A. Military ophthalmic surgery. *Medical War Manuals No. 3*, Lea & Febiger, 1918, p. 12.

THE FLUORESCENT LAMP FOR CATARACT SURGERY

H. ROMMEL HILDRETH, M.D.

SAINT LOUIS

Long-wave ultraviolet rays cause the crystalline lens to fluoresce. This phenomenon is helpful in cataract surgery because of the sharpness with which the lens surface and cortical particles may be seen. Short-wave ultraviolet rays are absorbed by the cornea and cause a photochemical reaction. With a suitable filter the fluorescent lamp may be used for ultraviolet therapy. Other filters make the lamp useful in photography of the eye. From the Department of Ophthalmology, Washington University School of Medicine.

Since its introduction two years ago, the fluorescent lamp has gained an increasing amount of interest. Its use in the treatment of the dislocated lens alone is restricted because of the infrequency of this type of case, but in such cases the lamp is invaluable. Its use has extended into other phases of ophthalmology because of the fact that the carbon arc is itself a very rich source of radiant energy in the solar spectrum. With filters one may select certain bands of the spectrum for specialized use, as in photography, red-free ophthalmoscopy, and fluorescence. More recently the lamp has been used for treatment purposes with a condensing lens made of special glass, which permits biologically active ultraviolet rays to be transmitted. One further use has passing interest for the ophthalmologist: since teeth fluoresce brilliantly, whereas porcelain and other filling materials do not, and since dead teeth seem not to fluoresce well, the dentist may find the lamp a distinct aid in his diagnostic work.

Acting as gateways, filters screen out most of the light produced in the arc and allow only a narrow part of the spectrum to be transmitted. The fluorescent filter illustrates this well; it allows a pale violet light to come from the lamp, in addition to an intense beam of long-wave ultraviolet light, but it screens the rest of the visible light and the heat rays. A beam of the long-wave ultraviolet ray is invisible to the eye, but, directed on to a substance with fluorescent properties, it causes the substance to glow. The visibility is derived not from the violet light itself but from the invisible ultraviolet rays. The property is a physical one and is shown by many substances, but in

the eye it is shown only by the crystalline lens.

For treatment a different part of the spectrum is required, the short-wave ultraviolet-light rays which cause sunburn. The carbon arc is rich in these rays but to condense them a special glass lens is required, and also a special filter that is transparent only to the shorter waves. The short-wave ultraviolet ray produces in the body what is known as a photochemical reaction; it has some effect on atomic structure and causes very definite biological changes in the body. In the eye, burning, redness, photophobia, and lacrimation occur several hours after exposure. When an animal eye is exposed to short-wave ultraviolet light and several hours later is sectioned the microscopic picture is specific and shows a condition which can always be recognized as one due to ultraviolet light.

In its present form the lamp consists of an arc chamber to which is fitted a condensing lens and filter. Focusing is accomplished by screwing the lens back and forth. The filter is held in a fairly large fiber ring which is easily removed when a change in filters becomes necessary. The lamp operates best on direct current but can also be used satisfactorily on alternating current. Carbons used for projector purposes burn most steadily and quietly and are generally best, in fluorescence as well as in photography. The supply of long-wave ultraviolet is ample with these carbons. For treatment there is available a therapeutic carbon which furnishes more short-wave ultraviolet in its spectrum and therefore is much more effective. The amount of long-wave ultraviolet rays is not increased, and since these carbons do not burn so

quietly and steadily as the projector carbons, they are not to be recommended for general use.

Other sources of ultraviolet light have been investigated in an attempt to build some simpler form of lamp. Each of them failed to meet requirements in intensity; hence, in spite of its bulkiness and heat, the carbon arc must be used. As to harmful rays coming from the lamp, one may state that there is a small amount of heat, but the amount was found to be too low, both clinically and experimentally, to be of any significance.

Lens surgery

The chief value of the lamp lies in its use in cataract surgery. The surface of the crystalline lens and its outline is shown by this instrument with a clarity not obtained in any other way. Particles of cortex and lens capsular remnants stand out clearly in the anterior chamber, and may therefore be easily removed. When one grasps the capsule during intracapsular extraction, its surface is so clearly demarcated that it is possible to discern the extent of the bite in the capsule forceps, and thereby an adequate hold is assured. If the capsule ruptures, the difficulty is easily seen at once and shows that further attempts at intracapsular extraction are useless. When capsulotomy is purposefully performed, the outline and extent of the capsule tear are shown. During expression of the nucleus or lens in capsule, the glowing mass stands out in striking contrast to the other parts of the eye. Some surgeons, however, prefer to have the ordinary operating-room light during this step. After extraction of the lens any cortical remains in the anterior chamber may be removed by irrigation. The capsule itself does not fluoresce, but adhering to it there is a layer of cortex which makes the capsule easily visible under close observation. The writer has been able to detect small particles of capsule in the wound by means of the fluorescent lamp, remnants invisible under ordinary white light.

The lamp should stand beside the operating table with the end of the tube

about one foot from the patient's eye. With the lens tube screwed in, a beam about one inch in diameter floods the eye. Blood in the anterior chamber naturally obscures a view of the lens, as it does under any other form of illumination, and it should be irrigated away.

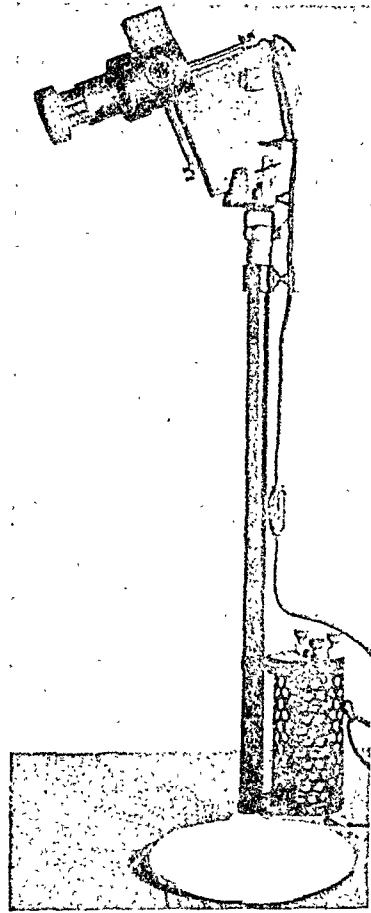


Fig. 1 (Hildreth). The fluorescent lamp.

In case the lens should become dislocated into the vitreous during the operation, it can be readily seen and removed. If the dislocation is deep into the vitreous, the position of the lamp can be changed so that the beam is aimed towards the surgeon's head and reflected into the patient's eye by means of a head mirror either in position before the surgeon's eye or raised above it.

Therapy

Short-wave ultraviolet light is absorbed almost entirely in the surface layers of the eye, the conjunctiva, and the cornea. The short-wave ultraviolet

rays alone are active biologically and since ultraviolet light acts only in the tissues in which it is absorbed, it is useless to attempt therapy inside the eyeball. The long-wave ultraviolet rays pass readily through the cornea, but are absorbed in the lens and reconverted into visible light, producing fluorescence. Under clinical conditions no ultraviolet light reaches the retina, and hence there is no danger of damage to that tissue. The little heat coming through the short-wave ultraviolet filter is too small to be of any harm to the retina under clinical conditions.

Since external diseases alone are suitable for treatment, in general it is be-

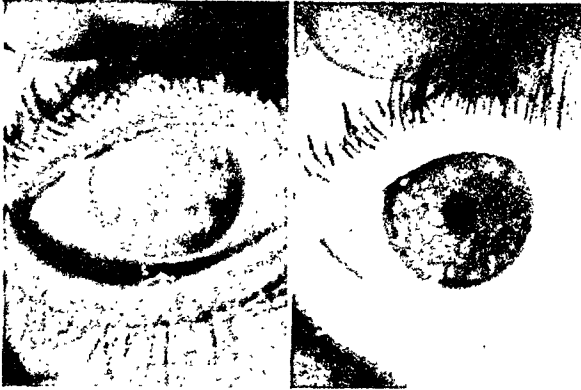


Fig. 2 (Hildreth). The photograph on the left, taken by white light, illustrates the opaqueness of the cornea as seen clinically. On the right is the same eye photographed by infrared rays.

lieved that corneal ulcers are the most common conditions that can be helped by the lamp. Almost any form of corneal ulcer will respond to ultraviolet irradiation, and there seems to be no contraindication restricting use in this type of ocular disease. The reader is referred to the extensive literature on this subject. In Duke-Elder's book, "Recent advances in ophthalmology," the subject is briefly but excellently presented with a full bibliography.

In therapeutic use of the lamp, the short-wave ultraviolet filter must be in place, and the glass lens that is transparent to the short-wave ultraviolet rays must be substituted for the ordinary glass lens. In addition, the therapeutic carbons must be inserted. If the electric supply is an alternate current,

the dosage will be longer than if the current is direct. Direct current gives a more intense beam of radiant energy from the lamp, but the therapeutic carbons burn more smoothly on A.C., and therefore the dosage is only about one third longer. From experimentation and clinical experience the writer recommends one-minute dosage with D.C. and one-and-one-half minutes with A.C. The carbons should be adjusted so that the light is as strong as possible.

The patient should be steadied by a head or chin-rest. If the eye is extremely sensitive, it is best to have it slightly anesthetized. The visible light from the lamp is so dim that it causes little or no discomfort to the patient, but a small amount of pantocaine may be used if desired. The lamp should be brought close to the eye and the lens extended fully, so as to give a short focus. With this adjustment the field will be about the size of an average cornea, which is an area not too large to expose at once. With the above-recommended exposure most patients will experience a mild photophthalmic reaction in from six to eight hours. A cold compress usually will give sufficient comfort so that rest can be secured during the night.

Photography

For clinicians who like to do their own photography the lamp offers certain advantages as a source of illumination, with a blue-glass filter. With this filter the brightness of illumination is not great, and consequently there is little discomfort to the patient; even inflamed eyes will stay open easily. Light from ordinary sources for photographing the eye is very bright, and in working quite a hardship on the patient, makes photography difficult. Although the blue light is not intense from the patient's standpoint, it is very active on the photographic film or plate, and snapshot exposures are successful. The blue monochromatic light prevents all chromatic aberration, no matter what camera lens is used; because of this fact the picture is of high quality and detail is very sharp.

One other type of photography that

is fascinating but not of general application is the taking of pictures by infrared light on infrared plates. Infrared rays have the power of penetrating media through which ordinary light does not pass and consequently when using a plate sensitive to infrared rays one can get pictures of the iris through an opaque cornea. A filter supplied for the lamp removes the ultraviolet and visible light but allows the infrared rays to be transmitted. With this intense source one can get pictures by snapshots. The degree of radiation is not troublesome at all to the patient, for it is concentrated on the eye, and the exposure time is short. Such pictures, of course, are valuable in an attempt to restore sight by such an operation as a

corneal transplant; also, they may have some utility in medico-legal work.

There remain other uses for the lamp, their value depending somewhat on one's personal interest and enthusiasm. With a filter that transmits in the green, the lamp is an excellent source for red-free ophthalmoscopy; the writer has used this by means of the reflecting ophthalmoscope and also the binocular ophthalmoscope. The greatest value of the lamp, however, lies in the field of lens surgery. While it is not intended that fluorescence should take the place of ordinary light, still it does have certain advantages that no other form of illumination can supply.

823 Metropolitan Building.

A CRITICAL SUMMARY OF SURGICAL EXPERIENCES IN 1934

EMORY HILL, M.D., AND ROBERT H. COURTNEY, M.D.

RICHMOND, VIRGINIA

This review of operations performed by members of a department of ophthalmology in a medical school during one year does not lend itself to abstracting. From the Department of Ophthalmology in the Medical College of Virginia. Read before the Pan-American Medical Association in July, 1935.

There are many statistical reports in the literature, dealing with the results of a series of operations, cataracts for example; and there are annual hospital reports, recounting the number and variety of operations done in a calendar year, which nobody reads; but there are not many critical summaries of the surgical experiences of a clinic, the relative frequency of the ophthalmic operations in a certain locality, and a discussion of the problems arising and results obtained in such an experience. The present communication aims to present such a report, discussing the experiences of the ophthalmic staff of the Medical College of Virginia during the year 1934, in both private and clinic practice, in the hospitals of the Medical College of Virginia, and in several other hospitals in Richmond. The surgeons who have collaborated with us and generously allowed us to use their records are Drs. Neilson H. Turner and Rudolph Thomason of Richmond, and Dr.

Frederick O. Fay, our late Resident, now of Wilmington, North Carolina.

This report offers nothing new and makes no boasts. Its excuse is the belief that any surgical material honestly handled and honestly reported, though small in volume, will suggest problems of technique, of surgical judgment, and of economy and efficiency; and that by comparison of types of case, relative frequency of the various ophthalmic diseases, and racial and social factors, we may reinforce and correct, here and there, each the other's impressions and convictions.

The majority of private patients have been cared for in the Johnston-Willis Hospital, a smaller number in the Memorial (white) and St. Philip (colored) Hospitals of the Medical College of Virginia, and one each in the Stuart Circle and St. Luke's Hospitals through the courtesy of the staffs of these latter two private institutions. The private patients total 107; the remaining 132

patients were in the wards of the teaching hospitals of the Medical College of Virginia (Memorial and St. Philip).

Table 1
OPERATIONS PERFORMED IN 1934

Cataract extraction, senile	64
Capsulotomy for secondary cataract	34
Preliminary iridectomy	4
Iridotomy	2
Cataract extraction, juvenile	3
Cataract extraction, traumatic	4
Needling congenital cataract	11
Iridectomy for occluded pupil	2
Delivery of dislocated lens	3
Glaucoma operations	38
Enucleations	24
Operations for detached retina	4
Repair of perforating wounds	9
Magnet extractions	2
Squint operations	9
Tumors of conjunctiva	4
Operations on tear passages	14
Miscellaneous	8
	239

Cataract extraction

Preliminary study. All cases are studied medically, with special reference to focal infections. This study includes a dental examination. We regard apical abscesses about the teeth as a most positive contraindication to a cataract operation. When the patient is as free of infections as can be and if his blood pressure is not unduly high or can be reduced by rest in bed, when he has no marked orthopnea, violent cough nor urinary obstruction we are willing to operate. Diabetes is not considered a contraindication if it can be controlled by diet and insulin before operation.

We follow this general rule as to the time of operation: when the better eye (from the standpoint of the lens changes) is no longer good enough for the patient's needs in his occupation, we operate on the other eye (the eye with the more mature cataract). This means that we seldom have a mature cataract in private practice, because the occupational needs of these patients preclude the long wait to which the less fortunate clinic cases are subjected, especially the negroes. This delay is due in part to the general neglect of the aged poor, but also in part to the antiquated advice too often given them before they

reach our clinic, that they must wait until the cataract is "ripe."

Preparation of the eye. As to the condition of the eye itself, aside from the cataract, we eliminate active inflammation, including the conjunctiva and tear-drainage apparatus. We do not make cultures nor smears if the conjunctiva shows no secretion nor hyperemia. This may be heresy to some surgeons but we have had no occasion to repent of it. We use AgNo₃ the day before operation, and irrigate with boric-acid solution the night before and the morning of operation. Atropine is instilled following these irrigations. We operate in the early morning with few exceptions. At the time of the operation considerable attention is paid to mechanical cleansing.

We have tried several kinds of sedatives. Fearing the tendency of morphine to cause nausea and vomiting, we avoided it for a long time. Then we used the so-called "twilight sleep," morphine and hyoscine, usually 1/6 gr. of morphine and 1/200 gr. of hyoscine. This has gradually been abandoned because of the occasional idiosyncrasy for hyoscine and the occasional vomiting which has followed the use of these drugs. We cannot say that harm has come from this vomiting except in one case. It is not violent but rather like the drooling of the infant whose food disagrees with him; but we have found that negro patients are excited by these drugs and we have abandoned them entirely for these patients. We have had poor success with the barbituric-acid preparations. For a while we used sodium amytal and luminal, but they were unsatisfactory, producing an irritability and restlessness, especially in negro patients, which led us to abandon these drugs. We now use, almost invariably, a combination of sodium bromide and chloral hydrate, usually 15 gr. of each, the night before and again one hour before operation. These have proved to be most innocent sedatives, leaving no untoward effects.

Anesthesia and akinesia: We use cocaine, 4-percent solution, for local anesthesia, adding a subconjunctival injection for further anesthesia of the iris.

We inject two or three drops of adrenalin subconjunctivally at the lower limbus to insure dilatation of the pupil after the anterior chamber is emptied. One of us (R. H. C.) suggested this technique several years ago. We have found it of great help in maintaining a dilatation of the pupil below, so that capsule forceps can be made to grasp the anterior capsule below the anterior pole of the lens, as Knapp recommends.

Formerly we used the Van Lint method of akinesia. In recent years we have substituted the O'Brien¹ method of blocking the facial nerve as it passes through the parotid gland, with 2-percent novocaine and adrenalin.

Since April, 1934, we have practiced retrobulbar injection of 4-percent novocaine (1 c.c.) and three minims of adrenalin. We had previously used (and still do) retrobulbar injections of 2 c.c. of 1-percent novocain and adrenalin to secure anesthesia and reduce tension in glaucomas, but we had not used this procedure in cataract operations. After conferring with Dr. Aaron Green,² of San Francisco, we introduced his method which we have consistently employed since April 11, 1934. The deeper anesthesia and the reduction of tension by the vasoconstrictor action of adrenalin are utilized, but the proptosis sometimes caused by a large amount of fluid injected into the orbit is avoided by using a smaller amount (only 1 c.c.) of a stronger solution* (4-percent novocaine). The results have been uniformly good: profound anesthesia and a soft eye in which the cornea is usually indented after the incision is completed. We are aware of theoretical objections to this procedure; we can only say that we have seen no harm from it, and we are quite confident that we have saved several eyes which could not have withstood the excessive manipulation demanded in removing complicated cataracts, unless the tension had been

greatly reduced and the anesthesia profound (table 2).

Table 2

64 CATARACT EXTRACTIONS (SENILE)

COMPLICATIONS:

Preoperative: (Delaying or modifying operation) Abscessed teeth (11); high blood pressure (6); obesity (2); deafness (2); dacryocystitis, glaucoma (secondary to endophthalmitis phacoanaphylactica), arthritis, convergent squint (amblyopia), high myopia, symblepharon, poor light projection, renal calculus requiring nephrectomy, asthma, epilepsy (each 1).

On the table: loss of vitreous (slight), 4 cases; bulging of wound (2); inability to look down (2).

Postoperative: vomiting (4), morphine and hyoscine used; incarceration of iris (2); glaucoma (2); temperature 5th day, and uveitis 10th day (1); retention of urine, intraocular hemorrhage, abscess of cornea, detachment of choroid (reattached spontaneously), cystitis, influenza, obstinate cough, asthmatic attacks, iritis, mental unbalance, hyphemia, uveitis (probably sympathetic, empty anterior chamber, 9 days (each 1).

Of these complications four were destructive of vision: (1) fever and uveitis, (2) intraocular hemorrhage, (3) abscess of cornea, (4) sympathetic (?) uveitis.

Enucleation has been performed in one of these cases.

Death followed in one case (heart attack) twelve days after successful operation.

VISUAL RESULTS:

	Cases
20/15-20/20	18
20/25-20/30	15
20/40-20/70	13
20/100-20/200	5
Less than 20/200	5
Death	1
Unknown	7 (all clinic)

The operation. An attempt is made to carry out the Knapp³ technique, but we do not usually make intracapsular extractions. This is no doubt due to timidity. We would suggest, however, that the Knapp technique for intracapsular extraction is a very satisfactory technique for extracapsular extraction. A small corneal incision is made with the object of getting a conjunctival flap. We are unable to make a large enough corneal incision with the Graefe knife, with the accuracy desired; therefore a

* It is difficult to say just who is responsible for this technique. Duverger (*Anesthésie locale en chirurgie orbito-oculaire*. Presse Médical, 1918, Aug., p. 408) seems to have popularized it in France and the Greens in the United States, especially in the matter of dosage (4 percent novocaine).

small incision is made and enlarged with scissors until somewhat more than one half of the cornea is circumcised. In our opinion a large corneal section is of paramount importance. We seldom take a stitch. We practically always make an iridectomy. An intracapsular extraction is not attempted in the majority of our cases, for various reasons, but partly because of our long experience with the extracapsular operation and our feeling that we can best serve our patients by doing the operation with which we are most familiar. In nearly half of our cases we attempted an intracapsular operation, using the Kalt or Arruga dull capsule forceps, attempting to follow Knapp's technique, making counter pressure at the lower limbus with the hook, grasping the capsule below the anterior pole of the lens, rocking the lens, attempting to rupture the zonule below, allowing the lens to tumble, and finally breaking the zonular fibers above. We are perhaps too timid in this technique. More often the capsule is torn before the zonule breaks; but in our experience the large capsulectomy thus obtained and the large corneal incision (with scissors) make it possible to get better extracapsular operations than by any other method. Of thirty-two attempted intracapsular operations, in our series during 1934, nine succeeded. We acknowledge that the attempts were somewhat half-hearted.*

As a precautionary measure the speculum is replaced by the Green lid elevator after the incision and iridectomy. We feel satisfied, as Green says, that any pressure on the lower lid tends to make the wound bulge (a fact easily demonstrated by using the finger), and therefore we let the lower lid alone.

In a few cases the anterior chamber was irrigated with half-normal sodium-chloride solution. This maneuver and the details of wound toilet are gauged by the behavior of the patient and the state of the wound. Regularly atropine

is used and White's ointment; surgeon's silk plaster holds the lids closed after the facial nerve has been blocked.

We usually make the first dressing on the third day, and leave the fellow eye open if the anterior chamber has reformed.

We have an understanding with the nursing authorities to the effect that every ward patient shall be provided with a pupil nurse, both day and night, from the time of operation until one eye is left open. This, to our knowledge, is an exceptional provision for ward cases, and we refer to it with pride. It means that the poorest negro brought in from the rural districts of Virginia, sleeping in a strange bed for the first time in fifty years, with both eyes covered, and frightened out of his wits, has as good a chance to recover without mishap from a cataract operation as has the well-to-do private patient.

Our difficulties, complications, and results are about as usual in such statistics. Of 64 patients, 7 have disappeared from view and one has died; of the remaining 56, 51 are benefited, 46 having very useful vision, and of these 33 have excellent vision.

Slightly more than one half of our senile-cataract patients required a needling of the posterior capsule.

Linear extractions, without iridectomy if possible, were performed in cases of juvenile and traumatic cataracts. The needling operation was used in congenital cataracts. We regard the Ziegler knife-needle as an extremely useful instrument, but insist upon the proper instrument, properly sharpened, and this is not always easy to obtain. Atropine and dionin are used for several months before the needling is repeated, in the belief that absorption goes on for a long time, and the total number of operations will be reduced if we are not too impatient.

Operations for glaucoma

According to type of glaucoma. We prefer the iridectomy of Von Graefe for acute glaucomas. This operation was performed on five eyes with primary acute congestive glaucoma, one eye with acute glaucoma due to a posterior

* Since 1934 we have modified our technique somewhat. We do not use atropine always before operation; we attempt simple extractions more often; and we practice more liberal irrigation of the anterior chamber in cases of extracapsular extraction.

dislocation of the lens (the lens being removed at a subsequent date, since iridectomy relieved tension only temporarily), and one eye with chronic congestive glaucoma. Trephining, with peripheral iridectomy, was performed on two eyes with acute glaucoma superimposed upon secondary chronic glaucoma (uveitis).

We are unable to find satisfactory evidence that any other operation equals the basal iridectomy of Von Graefe in the recent case (within a week of the onset of the first attack), and we prefer to avoid any further surgical manipulations. When an anterior synchia is of longer standing, whether tension has been high enough to cause a congestive reaction or whether the eye has remained in the noncongestive (simplex) state, the method of operation is selected according to the degree of tension, in part, but even more according to the field of vision. We believe that higher tensions and moderately wide fields demand an operation which secures a filtering cicatrix. On the other hand, we believe that slight elevation of tension can be controlled by lesser measures and that very narrow fields contraindicate operations which involve cutting the iris. With these criteria in mind we have performed the Elliot trephine operation on fourteen eyes, of which four were of the subacute or chronic type, six had glaucoma simplex, and four secondary glaucoma. In all of these cases complete iridectomies were performed but only peripheral iridectomies in the cases of acute glaucoma submitted to the Elliot⁴ operation (see foregoing paragraph). We are not prejudiced for or against the types of iridectomy; these are taken as they come; in our cases upon trephining, there has usually been tension high enough to cause considerable prolapse of iris through the trephine hole and therefore complete iridectomy has logically followed.

The Lagrange⁵ sclerectomy was done twice. These two eyes had deep enough anterior chambers to admit of the use of the Graefe knife, which was not usually the case in this series. The chief explanation of the paucity of Lagrange

operations, however, is that our experience has been much larger with the Elliot operation and, whether inherently easier or not, the latter is the easier operation for us.

Iridotaxis has been performed six times and iridencleisis twice, the types being chronic congestive glaucoma in three eyes, simple chronic in four, and secondary glaucoma in one. The indications were narrow field or blindness, only moderate elevation of tension and, in one case, high blood pressure. We are, of course, aware of the theoretical objections to iris-inclusion operations, but we have yet to see any harm come from them. They are easier to perform than most of the operations for the relief of tension, and they obviate enucleation in many cases. We are strongly inclined to advocate their wider use. As to the relative value of the two methods, iridotaxis and iridencleisis, we have no opinion. As stated in regard to the two chief sclerectomy operations, our experience has been chiefly with one (iridotaxis), through the influence of Drs. Harrower⁶ and Wilder,⁷ and we have not given the other method (iridencleisis) sufficient trial to justify a comparison. In one case of iridotaxis we were chagrined to find the next day that the iris had slipped back, leaving only a small knuckle in the wound. This was apparently due to too large a keratome incision, which we have recognized as the chief fault to be avoided in this operation.

Cyclodialysis alone was done four times (three times for glaucoma simplex and once for glaucoma secondary to cataract extraction), and cyclodialysis with iridectomy (Wootton⁸) twice for simple chronic glaucoma. The latter procedure is plausible and should theoretically be valuable (like the Jervey⁹ operation). We were not especially impressed by our experience with it, but no conclusions should be drawn from two cases. The indications for cyclodialysis were very narrow fields with only moderate elevation of tension, atrophic iris, and glaucoma due presumably to lens capsule blocking the anterior-chamber angle after cataract extraction. We are not sure as to the

mechanism of the relief of tension after this operation and have some apprehension of the danger of bleeding and temporary elevation of tension, but are inclined to continue to employ the operation in selected cases.

Our results have been fairly satisfactory. Acute primary glaucomas give uniformly good results if a basal iridectomy is done promptly. Subacute and chronic congestive cases have remained quiet with one exception, and no enucleation has been necessary as yet. Where vision of 20/200 or better existed at the time of operation, with a moderate field, improvement has occurred (20/70 to 20/25) with widening of the fields in seven cases. In general, we are satisfied if the process is checked even if not improved. In so protean a disease, occurring usually in the elderly, we cannot prevent further senile changes, and indeed we probably hasten them by operation. We believe that cataract is hastened by many glaucoma operations, especially the Elliot trephining.

Operations on the tear passages

We see fewer cases of chronic dacryocystitis than formerly. Early care of epiphora (which usually means simply dilating the puncta a few times) will often prevent this infection. When the obstruction is at the nasal end of the duct, repeated probings and injections of lipiodol, which has a favorable influence on the periductal lymphoid tissue, will often secure a patent duct. We are not impressed by the claims of persistent tearing after the removal of the sac, and we have seen no reason to resort to the various operations suggested as substitutes for excision of the lacrimal sac. We perform the latter operation if possible; if clean dissection is not possible, because the infection has already extended outside the sac, we cauterize with phenol or trichloroacetic acid.

The congenital obstructions seen in children usually yield to one probing. We ordinarily do this in the hospital, under general anesthesia. We have done it twice in the office. It is a question whether a baby is more disturbed by

anesthesia or by probing without anesthesia. We find a tendency among the pediatricians to postpone operation on the grounds that spontaneous recovery is likely to occur. This question needs investigation. Our impression is that spontaneous recovery is rare; but it may be that we see only the minority of cases in which there was no recovery.

Operations for squint

We regard surgical correction of squint as a last resort, except when young children have so high a degree of strabismus that one eye is practically out of commission because the image falls far away from the macula. In these cases we advise early operation, but see few of them. We nearly always operate for cosmetic purposes alone. Of all the methods tried we regard the Jameson¹⁰ procedure as the most satisfactory operation on a single muscle. It has all the virtues of tenotomy without its disadvantages and uncertainties. We modify the Jameson procedure slightly according to the suggestion of Frederick A. Davis¹¹; that is, we make the conjunctival incision opposite the site of the intended recession and suture the conjunctiva separately. This seems to make a neater wound and less post-operative reaction, and in no way detracts from the very great value of the recession. We would commend especially the Jameson needle, which we regard as by far the best needle ever devised for squint surgery. When a recession is inadequate, a Reese resection and advancement are added. The recession is performed first and then the Reese operation, so that all tension may be relieved from the sutures holding the advanced muscle. In two cases, because of very scant muscle tissue, we have advanced Tenon's capsule, using whatever device we could and not following any definite technique.

Our series is small, because we are very conservative in advising operation; but our results are satisfactory. One of nine cases definitely requires a second operation (as was predicted from the beginning) and another probably will. The other seven are perfectly satisfactory. We are aware that some

surgeons favor early operations. We simply cannot agree with the enthusiastic advocates of this practice.

Tumors of the conjunctiva

We have been interested in a type of small pigmented growth of the conjunctiva (only one in this series) which we have seen several times. All have been benign clinically (no recurrence in some years—two cases over ten years) and all pronounced epithelioma by competent pathologists. They occur in children, give no trouble except that they are disfiguring, are freely movable and easily dissected out. Perhaps they are recognized and removed earlier (because they are disfiguring) than other similar tumors and therefore impress us as benign.

The fourth case, a malignant tumor, presented a problem. We obtained permission for enucleation in case the frozen sections showed malignancy, and then decided to preserve the eye. The growth was easily dissected off, the eye had good vision, and we felt justified in using radium, with the understanding that the patient will remain

under observation and permit enucleation if there is any suspicion of recurrence.

Retinal detachment

We are encouraged by the good results obtained in recent years by various procedures used to secure reattachment of the retina. We had no success with the Gonin method. The Guist-Lindner¹² operation gave us several successes after we had come to regard this condition as perfectly hopeless. The electrocoagulation (diathermy) method is easier to perform and causes less trauma. We have had three recoveries in the past year in four cases attempted. One is not materially benefited. Retinitis proliferans followed retinal hemorrhages and although the immediate results were encouraging and the retina is largely attached now, vision is no better. This was a case of high myopia and operation was a last desperate resort. Many factors enter into this problem which are not yet settled. The remote results of such manhandling of delicate tissues have yet to be seen.

Professional Building.

Bibliography

- ¹ O'Brien, C. A. Local anesthesia in ophthalmic surgery. Trans. Sect. Ophth., Amer. Med. Assoc., 1927, p. 237.
- ² Green, A. S. and L. D. Deep infiltration in ophthalmic surgery. Trans. Amer. Acad. Ophth. and Otolaryng., 1922.
- ³ Knapp, A. A report of a series of extractions of cataract in the capsule, etc. Trans. Amer. Ophth. Soc., 1914, v. 13, p. 666.
- Intracapsular operation for cataract. Report on a fourth hundred successive extractions. Arch. of Ophth., 1933, v. 10, July, no. 1, p. 6.
- ⁴ Elliot, R. H. A treatise on glaucoma. Oxford Med. Pub., 1918; and numerous articles in the literature.
- ⁵ Lagrange, F. Rev. général d'Ophth., 1906; Arch. d'Ophth., 1906. The Ophthalmoscope, 1907; and numerous later articles in the French literature.
- ⁶ Harrower, D. Five years' experience with iridotaxis. Arch. of Ophth., 1918, v. 47, p. 37.
- ⁷ Wilder, W. H. Some observations on iridotaxis in the treatment of glaucoma. Jour. Amer. Med. Assoc., 1923, v. 81, Dec. 22, p. 2095.
- ⁸ Wootton, H. W. Cyclodialysis combined with iridectomy in glaucoma simplex; a preliminary report. Trans. Amer. Ophth. Soc., 1932, v. 30, p. 64.
- ⁹ Jervoy, J. W. A thesis on the etiology of glaucoma and a new operation. South. Med. Jour., 1924, v. 17, March.
- ¹⁰ Jameson, P. C. The surgical entity of muscle recession. Arch. of Ophth., 1931, v. 6, Sept., p. 329.
- Some essentials and securities which stabilize muscle operations. Trans. Amer. Ophth. Soc., 1932, v. 30, p. 38.
- ¹¹ Davis, F. A. Modification of Jameson recession operation for strabismus. Arch. of Ophth., 1934, v. 11, April, p. 684.
- ¹² Lindner, K. Ein Beitrag zur Entstehung und Behandlung der idiopathischen und der traumatischen Netzhautabhebung. Arch. f. Ophth., 1931, v. 127, pt. 2, p. 177.

MENINGOCOCCUS CONJUNCTIVITIS FOLLOWED BY SEPTICEMIA AND BEGINNING MENINGITIS

(A case report)

FRED M. REESE, M.D.
BALTIMORE

This case of meningococcus conjunctivitis followed by a meningococcus septicemia and aborted meningitis is reported for the reason that it presents an unusual sequence of events and indicates that the conjunctiva may serve as a portal of entry for the meningococcus. From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

Before the use of antimeningococcus serum, meningococcus conjunctivitis as a complication of cerebro-spinal meningitis was well known. Randolph,¹ in 1893, quotes Hirsch and Ziemssen and Hess as finding it as an invariable concomitant. McKee, in 1908² and 1909,³ isolated and positively identified the organism in the conjunctiva of three patients with cerebro-spinal meningitis, and in 1913,⁴ found the organism in the bacterial flora of a normal eye. Following the therapeutic use of antimeningococcus serum, conjunctivitis has become a rare complication, being absent in 66 cases reported by Lewis⁵ in 1931, and occurring only once in the large series reported by Tillett and Brown⁶ in 1935. Gifford and Day,⁷ in 1935, reported an isolated case of meningococcus conjunctivitis unassociated with any general symptoms.

McKee,² in 1908, raised the question as to whether meningococci in the conjunctiva were secondary to their presence in the nose, or if the conjunctiva itself might be an independent portal of entry. In 1904 Koplik,⁸ reporting 77 cases of cerebro-spinal meningitis, reported one case in which there was a definite history of conjunctivitis antecedent to the general symptoms of meningitis. A year later, Dorland Smith⁹ reported a case of meningococcus conjunctivitis occurring in a nurse who had been exposed to epidemic meningitis. The organism was identified by cultures. The conjunctivitis cleared up, after a few days, with local treatment and cerebro-spinal meningitis did not develop.

Tillett and Brown reported that the mode of onset in their cases of meningitis fell into three well-defined types:

1. Cases with upper respiratory infection of one to three weeks' duration before evidence of meningitis.
2. Cases with the onset accompanied by upper-respiratory-tract symptoms, but differing from the first group in a more severe and abrupt onset.
3. Cases with sudden and sometimes explosive onset, the symptoms being directly and primarily those of meningitis, without any preceding history of nose-and-throat infection. Only three patients in their series were admitted on the first day of the disease and this patient was one of them.

Abstract of case history

L. S., a nurse, aged 19 years, complained that she "awoke in the morning with a red, uncomfortable right eye." The family history was noncontributory. Her general health had always been excellent. She had had the usual childhood diseases and an appendectomy in the fall of 1934. Otherwise there were only occasional mild colds.

Present Illness. The patient awoke at 6 a.m. with a red, uncomfortable right eye, otherwise feeling generally well. She came to the accident room of the Wilmer Institute at 9 a.m., at which time examination revealed a mild conjunctivitis manifested by marked redness of the conjunctiva, a thin, seromucoid discharge, and slight edema of the lids and conjunctiva of the right eye. The cornea was clear. The interior of the eye was normal. The left eye was free from inflammation and normal in appearance. Argylol, followed by 2-percent boric-acid solution irrigations every hour, was ordered. She returned at noon, complaining that the eye was worse. The edema of the lids and con-

conjunctiva was more marked and the discharge more copious and muco-purulent. Smears and cultures were taken. The smears showed a gram-negative, intra- and extracellular diplococcus. Further questioning revealed that the patient had been on duty with a case of epidemic meningitis in the Harriet Lane Home.

The patient was immediately admitted to the hospital and half-hourly treatments to the eye were started. During the afternoon, general malaise, headache, and backache developed. By 4 p.m. she was quite ill, and an hour later a chill of moderate severity occurred. The white count at this time was 13,800 with 90 percent of polymorphonuclear leucocytes. The patient was transferred to the isolation ward of the medical service. A general physical examination at 6 p.m. was as follows: Temperature—103.8°, Pulse—134, Respirations—24, Blood Pressure—90/60. The patient was restless and apprehensive, but rational and quite cooperative. A few scattered, pale, rose-colored lesions about 3 mm. in diameter were seen in the skin. A large subconjunctival hemorrhage was present in the right eye. The lids were swollen shut with a copious muco-purulent discharge. The cornea was clear. The left eye was normal. There was slight nasal congestion, but no discharge. The tongue was heavily coated and the pharynx injected. The neurological examination was negative. The blood was normal except for the leucocytosis. The urine also was normal and the spinal fluid clear, under normal pressure, with no increase of cells.

The patient was found to be sensitive to horse serum and had to be desensitized. Ten cubic centimeters of polyvalent antimeningococcus serum was then given intravenously during the evening. The temperature dropped from

105.6° at midnight to 101.0° at 4 a.m. During the first night, treatments to the eye were continued. On the second day the eye was markedly improved and treatments were decreased to one every two hours. A small retinal hemorrhage developed in the left eye. During the second day, 30 c.c. of the serum were given intravenously in three doses of 10 c.c. each, and on the third day an additional 10 c.c. On the third and fourth days, definite resistance of the neck to flexion and a positive Kernig developed. These signs of meningeal irritation disappeared on the fifth day and did not return. The patient now gradually improved, except for a mild serum sickness on the ninth day.

The cultures taken from the conjunctiva, nose, throat, blood, and spinal fluid all showed the meningococcus which agglutinated types I-III. The patient never developed a classical meningitis, although the meningococcus was present in the spinal fluid.

This case is of special interest for the reason that the conjunctival sac was apparently the portal of entry for the infecting meningococcus. The patient, a student nurse, had been exposed to epidemic cerebro-spinal meningitis, but had worn the usual protective mask, and there were at no time upper-respiratory-tract symptoms. Whether the organism entered the blood stream directly from the conjunctiva or from the nose after passing down the lacrimal canal, could not be determined.

Summary

A case of meningococcus conjunctivitis followed by meningococcus septicaemia and an aborted meningitis is reported. The evidence in this case indicates that the conjunctiva was the actual portal of entry for the infecting organism.

References

- ¹ Randolph, R. L. A clinical study of 40 cases of cerebro-spinal meningitis, with reference to the eye symptoms. *Bull. Johns Hopkins Hospital*, 1893, v. 4, no. 32, p. 59.
- ² McKee, H. The cultivation of meningococcus from eye conditions complicating cerebro-spinal meningitis. *Ophth. Rec.*, 1908, v. 17, p. 438.
- ³ ——— Another case of meningococcus conjunctivitis. *Ophth. Rec.*, 1909, v. 18, p. 304.
- ⁴ ——— Meningococcus conjunctivitis. *Ophthalmoscope*, 1913, v. 11, p. 75.

- ⁵ Lewis, P. M. Eye observations in epidemic cerebro-spinal meningitis. *Southern Med. Jour.*, 1931, v. 24, no. 2, p. 101.
- ⁶ Tillett, W. S., and Brown, T. McP. Epidemic meningococcus meningitis. An analysis of twenty-six cases, twenty-one of which occurred in the spring of 1935. *Bull. Johns Hopkins Hospital*, 1935, v. 57, no. 5, pp. 297-316.
- ⁷ Gifford, S., and Day, A. Acute purulent conjunctivitis due to the meningococcus. Report of a case. *Arch. of Ophth.*, 1935, v. 13, p. 1038.
- ⁸ Koplik, H. The clinical features of cerebro-spinal meningitis, or cerebro-spinal fever of the epidemic type. *Med. News*, 1904, v. 84, p. 1065.
- ⁹ Smith, D. Eye infection. Second hundred cases with bacteriological examination. *Arch. of Ophth.*, 1905, v. 34, p. 481.

STAPHYLOCOCCUS TOXIN COMBINED WITH LENS EXTRACT AS A DESENSITIZING AGENT IN INDIVIDUALS WITH A CUTANEOUS SENSITIVITY TO LENS EXTRACT

EARL L. BURKY, M.D. AND HERBERT C. HENTON, M.D.

BALTIMORE

Lens extract, when combined with staphylococcus toxin and injected intracutaneously, first sensitizes and then desensitizes the rabbit to lens extract. Injection of lens extract alone does not produce this effect. Because of this synergistic effect of the toxin on lens extract, a mixture of lens extract and staphylococcus toxin was used to treat two patients with intraocular inflammation associated with cutaneous sensitivity to lens extract. Both patients lost the cutaneous sensitivity to lens extract after treatment and it is probable, but has not been proved, that the ocular tissues were also desensitized. From the Wilmer Ophthalmological Institute, Johns Hopkins Hospital and University.

In an earlier report¹ it was shown that rabbits subjected to repeated intracutaneous injections of lens extract and staphylococcus toxin developed a cutaneous sensitivity to lens extracts derived from the rabbit or other species of animals. When the lenses of these sensitized animals were needled, a marked intraocular inflammation developed. This ocular reaction resembled, clinically and histologically, endophthalmitis phacoanaphylactica in humans. If the cutaneous injections were continued over a relatively long period of time the cutaneous reactions to lens decreased and then became entirely negative. At this point, needling of the lenses produced only traumatic cataracts. Such sensitizing and desensitizing effects could not be obtained by the injections of lens extract alone.

On the basis of this observation—the synergistic effect of toxin on lens extract—we have used a mixture of staphylococcus toxin and lens extract to desensitize patients who showed a cutaneous sensitivity to lens extract associated with intraocular inflammation believed to be due to the absorption of lens protein in a hypersensitive individ-

ual. Two such patients have been thus treated. This method of treatment produced such striking changes in the cutaneous reactions to lens that it seems advisable to report the method used and the results obtained.

Materials and Methods

Lens extract was prepared as previously described.¹ Staphylococcus toxin was prepared by inoculating a toxin-forming strain of staphylococcus to hormone bouillon and incubating at 37° C. for 10 days. At the end of this time, .5-percent trikresol was added and the culture filtered through a Berkefeld V filter. Necessary dilutions of the lens extract and the toxin were made in 0.85-percent sodium-chloride solution containing .5-percent trikresol.

The hormone bouillon was prepared as follows:

DIRECTIONS FOR PREPARING 15 LITERS OF HORMONE
BOUILLON

A.

Fresh ground beef heart. (Do not remove fat before grinding.) 15 lbs.
Eggs 9
Distilled water 10 liters
Stir the eggs in about one liter of water and then add to the meat and water.

Stir occasionally while the mixture is heated to 50°C.

B.

Neopeptone (Difco) 150 Gm.
Sodium chloride 37.5 Gm.
Distilled water 5 liters
Bring to a boil and slowly add
sheet gelatin 150 Gm.

When A has reached 50°C. add B. Stir thoroughly and bring to a boil. Do not stir after the first mixing. Boil ten minutes. Remove about 500 c.c. of fluid and filter through paper. Portions of 50 c.c. are placed in 100-c.c. beakers. To each beaker is added an increasing amount of N/1 HCl. Begin with 0.5 c.c. and increase by 0.25 c.c. to 1.5 c.c. One of these amounts of HCl will cause the maximum precipitate. An aliquot portion of HCl is added to the main portion of the mixture. Boil ten minutes. Strain through a colander. (Do not filter through any organic material.) Autoclave at 15 lb. pressure for 15 minutes. Pour into 6 liter jars and allow sedimentation to proceed for 24 hours at room temperature. The supernatant medium is siphoned off, leaving the fat and sediment behind. The pH is adjusted to 8.0 in the cold with N/1 NaOH and the volume is made up to 15 liters after the addition of the NaOH. Bring to a boil and pour into glass jars. In two or three hours the flocculent precipitate which has formed settles out. The supernatant fluid is siphoned off into large flasks and autoclaved at 15 lb. for 15 minutes. It is advisable to store these flasks for several days so any precipitate forming after the autoclaving can be removed by siphoning off the clear supernatant fluid. Repeated autoclaving will not affect this medium. If this broth is properly made it will support a luxuriant growth of gonococcus or meningococcus without the addition of any growth-promoting substances such as ascitic fluid.

This medium is a modification of the one described by Huntoon in the *Journal of Infectious Diseases* (1918, v. 23, p. 169). It differs from the one he described in that acid is added and the fat is not removed from the hearts. By the above method the acid first hydrolyzes some of the fat, forming glycerol and precipitated fatty acids. The NaOH then converts some of these substances into soaps. It is probable that the soap content differs from that in the ordinary medium.

The method for preparing hormone bouillon has been given in detail because there is considerable evidence that the medium and the method of toxin production is of importance. Since the publication of the earlier report,¹ several investigators have attempted to

repeat these experiments. In general, the results were not confirmatory until hormone bouillon or some modification of this formula was used.² In addition it is now definitely known that staphylococcus toxin produced in hormone bouillon differs markedly from that produced by other methods.

Cutaneous sensitivity to lens extract was determined by injecting 0.1 c.c. of beef lens extract, 1:100, into the volar surface of the forearm. A positive reaction was shown by the appearance of erythema and swelling in 24 to 48 hours after the injection. After the lens reaction was determined the patient was injected with 0.1 c.c. of staphylococcus toxin, 1:100, in the skin of the opposite forearm.* According to the amount of reaction to the toxin after 48 hours, a treatment mixture of lens extract and staphylococcus toxin was prepared and injected intracutaneously twice a week. The further details of treatment are given in the individual case histories.

Case 1. A. W., a white male, aged 11 years, was admitted to the Wilmer Ophthalmological Institute on July 27, 1934, with a diagnosis of congenital cataracts, bilateral, after discissions in 1926 and 1928, elsewhere. Vision: O.D. = 5/200, could not be improved; O.S. = 20/200, with +5.00 D. sph. = +2.00 D. cyl. ax. 180° = 20/70. On August 3d and 10th, discissions, O.S., were performed. On August 11th, the tension rose in this eye. On August 13th, a paracentesis and lavage of cortex, O.S., were performed. The next day milk, injections were begun. On August 22d, iridectomy and lavage of cortex were done. On September 23d, an intracutaneous injection of lens extract, 0.1 c.c. in a dilution of 1:100, caused an area of erythema and swelling 3.0 x 2.0 cm. Two days later a 0.1-c.c. intracutaneous injection of staphylococcus toxin, 1:100, caused an area of erythema and swell-

* We believe this order of procedure to be important because we have observed in certain individuals, reactions resembling those described by Schwartzman,³ apparently brought on by the action of the toxin; i.e., certain individuals, when injected with staphylococcus toxin and another antigen in different skin sites react to the second antigen non-specifically.

ing 8.0 x 6.0 cm. Both of these reactions were read after 48 hours. On September 27th, staphylococcus toxin, 1:100, in lens extract, 1:50, caused a reaction 9.0 x 7.0 cm. This mixture was diluted 1:10 and 0.1 c.c. was injected intracutaneously, twice a week until October 29th, when the left eye was no longer inflamed. At this time neither the treatment mixture nor the lens extract caused any cutaneous reaction. Treatment was then discontinued. May 2, 1935, the patient did not react to lens

photographs of cutaneous reaction and ocular condition). Two days later staphylococcus toxin, 0.1 c.c. in a dilution of 1:100, caused a reaction 4.5 x 4.0 cm. A treatment mixture consisting of staphylococcus toxin, 1:100, in lens extract, 1:50, was prepared and intracutaneous injections of 0.1 c.c. twice a week were begun. After the patient was discharged he returned to the outpatient department at irregular intervals so that he did not receive an orderly course of injections. However, on De-



Fig. 1 (Burky and Henton). Patient C. S. Condition of left eye on September 23d when endophthalmitis phaco-anaphylactica was suspected.



Fig. 2 (Burky and Henton). Cutaneous reaction to lens extract on September 23d.

extract. A capsulotomy of the left eye was done without any sequelae. On July 12th, an optical iridectomy was performed on the right eye. The patient was discharged July 25th, with a negative cutaneous reaction to lens extract and with the following refractive correction: O.D. +10.00 D. sph. \approx +0.75 D. cyl. ax 180°, resulting in vision of 8/200 (amblyopia exanopsia); O.S. +10.00 D. sph. \approx +0.75 D. cyl. ax 180°, with which vision was 20/40, add +3.00 D. sph. = J1.

Case 2. C. S., a white male, aged 52 years, was admitted to the Wilmer Ophthalmological Institute on June 25, 1934, with a diagnosis of immature cataracts, bilateral. Vision: O.D. = 1/100; O.S. = 2/200, could not be improved. On June 28th, an extracapsular extraction on the left eye was performed. Considerable lens substance was retained. Within a few days an iridocyclitis developed which continued until September 23d, when lens extract, 0.1 c.c. in a dilution of 1:100, caused a cutaneous reaction of 4.5 x 4.0 cm. (see

cember 5th he no longer reacted to the treatment mixture or lens extract alone and the eye which had been operated on was quiet. On March 11, 1935, he was again tested with lens extract and found to be nonreactive. An iridectomy was performed on the right eye at this time without any sequelae. He was readmitted on October 2d, at which time he was likewise nonreactive to lens extract. On October 5th, an intracapsular extraction was attempted on the right eye. This was not successful and an extracapsular extraction was performed. Considerable lens substance was retained. From this time the patient's clinical course was unsatisfactory. It was impossible to keep him in bed and he also developed a urinary retention which required repeated catheterization. Atropine conjunctivitis and dermatitis developed. This was cleared up by October 26th. In spite of these complications there was no intraocular inflammation suggestive of endophthalmitis phaco-anaphylactica. On November 16th, a lavage of the anterior cham-

ber for removal of retained lens substance was done. This was followed by a purulent postoperative infection with panophthalmitis and loss of the eye. Cutaneous reactions to lens extract remained negative.

Comment. These two cases show that the cutaneous reactions to lens extract can be changed from positive to negative by the intracutaneous injection of a mixture of staphylococcus toxin and lens extract. This change cannot be brought about by the injection of lens extract alone. One of us (E.L.B.) has attempted desensitization in 10 or more patients by the subcutaneous injection of lens extract alone. None of these patients lost cutaneous sensitivity.

It cannot be categorically stated that this change in the cutaneous reaction was accompanied by a loss of ocular sensitivity, for we have no way of definitely determining the sensitivity of the ocular tissues to a foreign protein. In case 1, however, the good end result in the eye followed the subsidence of the cutaneous sensitivity. The end result in case 2 was poor, but it is probable that the sensitivity played no part in the

final result, for there was no immediate nor delayed intraocular reaction to the retained lens substance, the right eye having been lost through postoperative infection.

The results obtained in two cases do not justify our coming to definite conclusions. The loss of cutaneous sensitivity was, however, definite in both patients and all of the evidence points to a loss of ocular sensitivity. Approximately two years have elapsed since this method of treatment was begun. In that time only two cases have been encountered in the Wilmer Institute in which desensitization seemed indicated. Because of this low incidence it would require too long a period to secure enough cases definitely to prove the value of this form of therapy. Therefore, this method is presented with the hope that it will be given a wider trial.

Summary. By the intracutaneous injection of a mixture of lens extract and staphylococcus toxin, a preëxisting cutaneous sensitivity to lens can be eliminated. It is probable, but has not been proved, that ocular sensitivity to lens is also eliminated or reduced.

References

- ¹ Burky, E. L. Experimental endophthalmitis phaco-anaphylactica in rabbits. *Arch. of Ophth.*, 1934, v. 12, pp. 536-546.
- ² Personal communications.
- ³ Shwartzman, G. Phenomenon of local skin reactivity to *B. typhosus* culture filtrates. *Jour. Exp. Med.*, 1928, v. 48, p. 247.

AN ILLUMINATING DEVICE TO BE USED AS AN ATTACHMENT TO THE BINOCULAR CORNEAL MICROSCOPE FOR GONIOSCOPY AND GONIOPHOTOGRAPHY

RAMON CASTROVIEJO, M.D.
NEW YORK

An illuminating device is demonstrated that can be attached to any standard corneal microscope, which, thus equipped, may be used for gonioscopy and goniophotography. With the aid of the contact glass for fundus examination, and the corneal microscope equipped with the illuminating device, observations of the fundus can be made with high magnifications. Demonstrated before the American Academy of Ophthalmology and Otolaryngology at Cincinnati, September 14-20, 1935.

The instrument (fig. 1) consists of a 3.5-v. 3.8-amp. straight filament lamp of special design, adjustably mounted

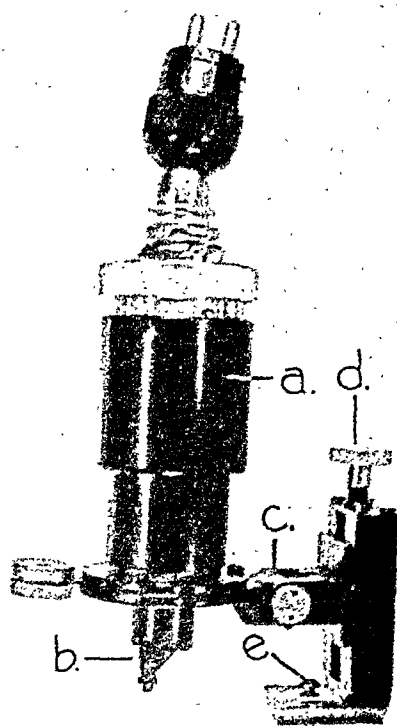


Fig. 1 (Castroviejo). Author's illuminating device.

in a vertical lamp housing (fig. 1-a). Below the lamp are mounted a totally reflecting prism of 87 degrees' deviation and a condenser of 2.5-cm. focal length (fig. 1-b). The vertical adjustment of the filament near the focal plane of the condenser permits the use of a collimated, diverging, or converging beam, as desired, of narrow cross-section and high intensity. The illuminating system, as a unit, is mounted on a tilting hinge for adjustment (fig. 1-c) at various angles to the axis of the microscope, to avoid reflexes. Behind the hinge joint, a ver-

tical adjustment by a quick-acting screw (fig. 1-d) permits a rapid leveling of the entire accessory.

This device attaches directly to the mounting of the binocular corneal microscope by means of a clamp screw (fig. 1-e and fig. 2). Located between the objective mounts, it provides central illumination close to the object, with provision made on the mounting to avoid direct reflex into the objectives of the microscope. The axis of illumination in relation to the axis of the objectives may vary vertically between 3 and 18 degrees.

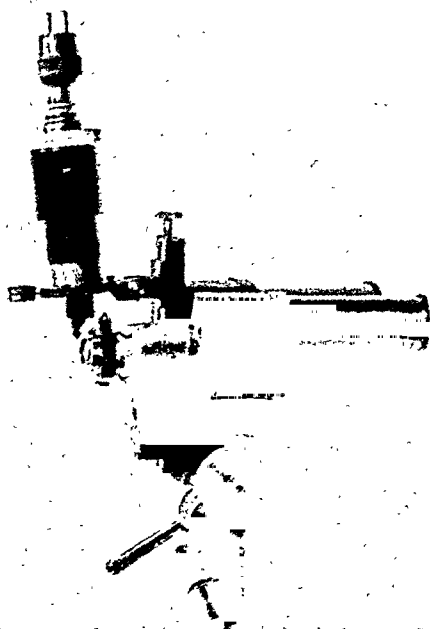


Fig. 2 (Castroviejo). Illuminating device mounted on the binocular corneal microscope.

Gonioscopy and goniophotography in human eyes

The patient is placed in the recumbent position and the eye anesthetized

with several instillations of holocaine hydrochloride, 1-percent solution. The conjunctival sac is freely irrigated with normal saline solution to wash out mucus and other foreign substances which, interposed between the contact glass and the cornea, may disturb the observation. The Zeiss-Koeppel contact glass with full hemisphere for iridic angle, also called "C" glass when made by Bausch and Lomb Optical Company of Rochester, New York, is placed in position with the margins of the eyelids surrounding the glass and lying in the groove around its border. The glass is thus held by the eyelids and pressed tightly against the eyeball. Normal saline is then injected to fill the space left between the concave surface of the contact glass and the cornea. For this maneuver, a small canula attached to a rubber bulb, similar to that which is used for the irrigation of the anterior chamber of the eye, may be employed. The external surface of the glass is then washed with distilled water and care-

coating of salt deposit which greatly disturbs the view.

The observation of the angle is made with the microscope, equipped with the illuminating device, as indicated in figure 3. Various magnifications can be obtained by using different objectives, but best results will be obtained with the objectives of low power, which, having more depth of focus, permit the simultaneous observation of different planes. The stereoscopic view of the angle of the anterior chamber obtained



Fig. 3 (Castroviejo). Showing how the examination of the angle of the anterior chamber is conducted.

fully dried with a piece of gauze. If the saline solution comes in contact with the external surface of the glass, the rapid evaporation of the fluid leaves a

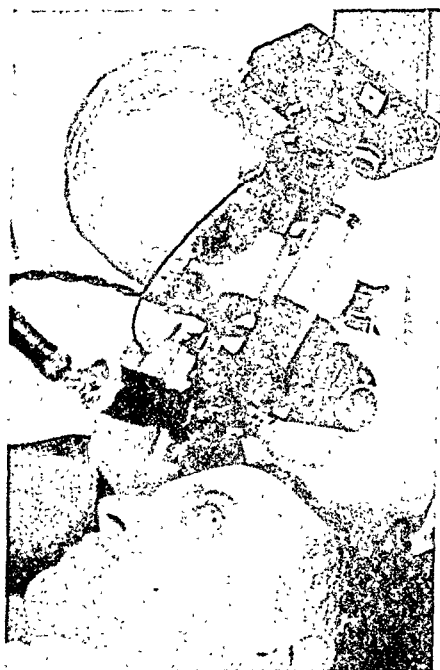


Fig. 4 (Castroviejo). Showing how the equipment for photography of the angle is assembled.

with the binocular microscope, used as described, provides greater ease in the interpretation of histological and pathological details which may be puzzling when monocular observations are employed. For demonstration purposes the binocular microscope may be used by two observers simultaneously, each one looking through a different ocular. In this fashion the instructor points out the interesting details to be observed by the second person and thus it becomes most useful for teaching.

If a photograph of the angle is desired, one of the oculars is replaced by a miniature camera (fig. 4) equipped with a lateral view finder. The observa-

tion of the angle is made through the lateral view finder. When the desired field of the angle has been brought into focus, the prism action which deviates the image towards the lateral view finder is automatically interrupted by making exposure with a special cable release. Photographs may be taken with exposure of one twentieth of a second (fig. 5).

For photographic purposes the microscope with the accessories should be

when the anterior segment of the eye is examined with the binocular microscope and the slitlamp. The patient is in a sitting position, his head kept steady in the head and chin rest, and the fundus is observed with the binocular microscope equipped with the illuminating device. It is convenient to have the microscope mounted on a heavy stand, equipped with a cross-slide adjustable movement, to facilitate focusing.

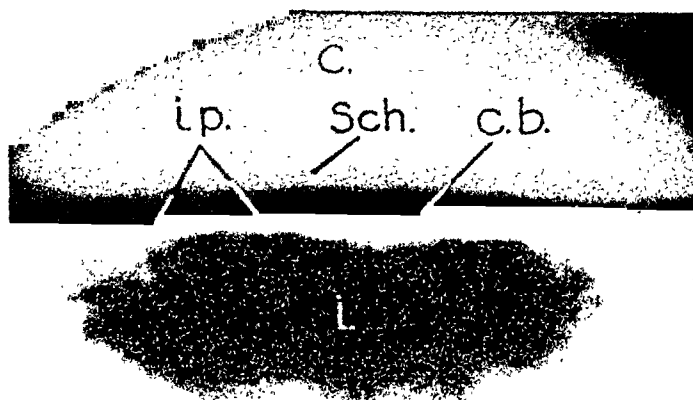


Fig. 5 (Castroviejo). Photograph of the angle of the anterior chamber of a normal eye: c., cornea; Sch., Schlemm's canal; c.b., ciliary body; i.p., Iris processes; i, Iris.

mounted upon a heavy compound base for the binocular microscope, which permits a free and fully controlled movement of the camera in every desired direction for adjustment and focusing without being subject to vibrations.

Examination of the fundus

For this purpose the most recent Zeiss model of contact glass for fundus examination is required. This contact glass has a flat anterior surface of 15 mm. diameter, the previous model having a 9 mm. flat surface. The new model makes it easier for the pupil to lie beneath the examining area of the glass, when it is placed in position. The pupil should be widely dilated, the contact glass placed in position and the space between the eye and the glass filled with normal saline solution. The observation is now made in the same way as

Very clear observations of the fundus can be made in this way with magnifications ranging from 15 to 60 diameters, depending on the objectives used. The author has been able to obtain photographs of the fundus, using the equipment described above, but for this it is necessary to have a maximum dilation of the pupil and a very coöperative patient. However, photography of the fundus with standard cameras and methods which do not necessitate the use of contact glasses is more practical.

I am indebted to Dr. M. Uribe Troncoso for his instruction in gonioscopy of both human beings and animals. It was he who first demonstrated to me the angle of the anterior chamber of animals, with the aid of the gonioscope and the Koeppe contact glass. The easy observation of the anterior-chamber angle of animals gave me the idea of utilizing animals to develop some

means of obtaining photographs of the angle. A technique was devised which permitted photography of the angle of both human beings and animals.* However, it was complicated, necessitating the use of instruments with which

*Castrovicjo. Amer. Jour. Ophth., 1935, v. 18, June, p. 524.

ophthalmologists are not well acquainted, and therefore the method was impractical.

I wish to express my appreciation to Mr. Victor M. E. Koch, of Carl Zeiss, Inc.—New York Agents for Carl Zeiss, Jena—for his coöperation in making the instrument here presented.

PARALYSIS OF DIVERGENCE OF FUNCTIONAL ORIGIN

(A case report)

C. P. CLARK, M.D.

INDIANAPOLIS, INDIANA

A young married woman complained of the sudden onset of convergent strabismus and diplopia, which was found to be due to paralysis of divergence. Neurological examination was negative. The recent death of the patient's mother, the serious illness of her father which later terminated fatally, and the loss of employment of her husband created an intolerable mental conflict. Recovery occurred from the divergence paralysis soon after the husband found employment and the patient became resigned to the loss of her parents.

Mrs. W. D. B., white, aged twenty-six years, was examined by me for the first time on November 22, 1933. Her complaints were of blurred distant vision, strabismus, diplopia, and pain in each eye, greater in the right than in the left.

The past personal history disclosed the following facts: She had never had any serious illness. The usual childhood diseases were attended with no serious complications nor sequellae. Vision for distant objects was not so good as that of many of her associates, but she did not choose to wear spectacles and for that reason had been content with her reduced vision; she had no difficulty with near work and read a great deal. The patient had been married two-and-one-half years; there had been no pregnancies and no menstrual disturbances. Her mother had died two years previously, the death causing severe mental shock to the daughter. At about the time the patient was becoming reconciled to the absence of her mother, her husband lost his position. The mental hardships that accompany economic reverses harassed the patient. A few months after her husband had lost employment, her father had been taken ill with a serious cardiac ailment. This was about three weeks prior to the on-

set of the ocular and visual symptoms of the patient. Mrs. B. attempted to care for her father and this required her attention for many hours of the day and night.

The present ailment began about November 15, 1933. At first the patient experienced considerable aching in both eyeballs; soon afterward she observed that objects a few feet distant were seen double. Newsprint was blurred and the lines of print became mixed up unless she held the paper close to her face. She was unable to read for very long at a time on account of the early onset of pain in eyes and orbits. Her husband noticed that her eyes turned in.

Examination. No pathology was found other than that which will be described for the eyes. The blood Wassermann reaction was negative.

Central vision in the right eye was 6/60; in the left eye, 6/40.

Pupils: These were round and each was approximately 3.5 mm. in diameter. They responded normally directly and consensually to light and convergence stimuli.

The lids and ocular appendages were normal in appearance.

Ocular movements: There was concomitant convergent strabismus. When the patient was asked to look at an ob-

ject six meters distant, the deviation varied from twelve to twenty-five degrees. Fixation alternated between the two eyes, and there was difficulty in fixating with either eye unless the other was occluded. The field of rotation was normal for each eye when tested with the opposite eye occluded. Homonymous diplopia was present. The deviation of the eyes remained constant in the cardinal directions of the gaze so long as the distance of the object of fixation from the eye was unchanged; but the separation of the images increased as the object of fixation was carried away from the patient and decreased with its nearer approach. Separation of the images did not change when the test object was moved from the primary position into the different fields of gaze. Binocular single vision was present when the test object was held from 60 to 70 cm. from the patient's face. The convergence near point was six centimeters.

The ocular fundi were normal.

The refraction was determined under five-percent homatropine cycloplegia and was found to require: O.D., -0.25 D. sph. ≈ -2.00 D. cyl. ax. 90° ; O.S., -0.25 D. sph. ≈ -2.25 D. cyl. ax. 100° . With this correction vision equalled 6/6 in each eye. Diplopia was more troublesome while the patient wore this lens combination. At postcycloplegic examination, an additional half diopter of minus sphere was needed to give 6/6 vision.

On different examination dates the convergence near point varied from 5 to 12 cm. and binocular single vision could be obtained at distances ranging from 10 to 90 cm.

The patient was observed at intervals until February 24, 1934, when she was placed under atropine cycloplegia for one week. At the end of that time the refraction was found to require: O.D., -2.00 D. cyl. ax. 90° ; O.S., -2.25 D. cyl. ax. 100° . With this correction vision equalled 6/6 in each eye. The ocular deviation remained essentially the same as that on November 22, 1933.

Dr. Frank Hutchins examined the patient at this time and found no organic lesion of the nervous system. It was his

opinion that the functional disturbance was caused by emotional stress which was aggravated by the physical exhaustion incident to the responsibility of caring for her father. Lugol's solution was prescribed. Amytal was given to induce sleep. The patient was relieved of the care of her father and by March 10, 1934, felt better. There was a convergence of fifteen degrees for distance fixation in the primary position.

The patient was reexamined at intervals until June, 1934. During the period from March to June her father had died. The removal of the anxiety and uncertainty engendered by his illness appeared to have a beneficial effect upon the patient. During June, 1934, her eyes would deviate nasally whenever she became fatigued. Diplopia could be elicited when the eyes were rotated to the extreme left. At about this time the husband found employment in a distant city and the patient changed her place of residence. During the fall of 1934, she sent word that she had no trouble with double vision nor with the eyes' becoming crossed as long as she did not become fatigued.

A diagnosis was made of functional paralysis of divergence, which in this case may be ascribed to functional disturbances initiated by mental shock and anguish upon the death of the mother, intensified by anxiety over economic problems related to her husband's loss of employment, and to physical exhaustion incident to nursing her father during his last illness along with the mental perturbation arising from the fear and apprehension of his approaching death.

Paralysis of divergence is a rare anomaly of the conjugate ocular movements. It is to be differentiated from bilateral abducens paralysis and spasm of convergence. In the former there are to be found the classical symptoms of muscle paralysis. Spasm of convergence is also an unusual finding; the spasm is intermittent, is associated with efforts to look at near objects, and is usually accompanied by nystagmus. During the attacks the pupils contract.

During the past several years, a few

cases of paralysis of divergence have been recorded in ophthalmic literature. Chambers¹ reported a case of paralysis of divergence that accompanied encephalitis lethargica. Lebensohn² had two patients with this condition; in one the anomaly arose in association with chorea and in the other with tabes. Dunphy³ reported the phenomenon in a patient with a diagnosis of multiple sclerosis. Howard⁴ saw a patient who had metastases from carcinoma of the breast and in whom divergence paraly-

sis appeared abruptly. Roese⁵ reported one case; the patient was riding on a train when the condition occurred. Stokes⁶ reported five cases of his own and stated that up to 1934, fifty cases in all had been recorded in the literature. Shannon⁷ reported divergence paralysis in a young man during an attack of "la grippe"; the patient recovered and the ocular disturbance disappeared. Bruce⁸ recently published an excellent review of the subject.

921 Hume-Mansur Building.

References

- ¹ Chambers, E. R. Paralysis of divergence in encephalitis lethargica. *Brit. Jour. Ophth.*, 1924, v. 8, pp. 417-418.
- ² Lebensohn, James. Paralysis of divergence with chorea and with tabes. *Amer. Jour. Ophth.*, 1926, v. 9, pp. 684-686.
- ³ Dunphy, E. B. Paralysis of divergence. *Amer. Jour. Ophth.*, 1928, v. 11, p. 298.
- ⁴ Howard, H. J. Divergence paralysis. *Amer. Jour. Ophth.*, 1931, v. 14, p. 736.
- ⁵ Roese, H. F. So-called divergence paralysis. *Abst. Arch. of Ophth.*, 1933, v. 12, p. 617.
- ⁶ Stokes, W. H. Paralysis of divergence. *Arch. of Ophth.*, 1934, v. 11, p. 651.
- ⁷ Shannon, C. E. G. Divergence paralysis. *Arch. of Ophth.*, 1935, v. 14, p. 163.
- ⁸ Bruce, G. M. Ocular divergence; Its physiology and pathology. *Arch. of Ophth.*, 1935, v. 13, p. 639.

NOTES, CASES, INSTRUMENTS

SPONTANEOUS RUPTURE OF THE SCLERA (TUBERCULOUS)*

FRANCES RICHMAN, M.D.
BROOKLYN, NEW YORK

Mrs. V. W., colored, 25 years old, was admitted to the eye service of the Kings County Hospital, on July 10, 1935. She complained of sore eyes and loss of vision. The present acute ocular condition dated back two weeks, but six months previously the patient had noticed a beginning diminution in vision for which she had sought treatment at a clinic.

The patient gave a history of having two children, ten and eight years old; no miscarriages; normal menstrual history with intermenstrual leucorrheal discharge. Three years ago she was operated on at the Long Island College Hospital for a "ruptured intestine."

Both eyes showed a slight puffiness of the lids and a moderate degree of photophobia. The conjunctiva had the milky coloring and tenacious mucous secretion of vernal catarrh. There was only mild circumcorneal injection; the cornea of each eye had numerous mutton-fat deposits on Descemet's membrane; the anterior chambers were deep; there were irregularly contracted pupils as a result of posterior synechiae; each iris was muddy and bound down to the lens capsule at the pupillary border by several caseous nodules. No view of deeper structures could be obtained. Finger tension was within normal limits. The patient counted fingers at one foot with each eye.

Under the use of atropine, the eyes felt better; the caseous nodules and mutton-fat precipitates became somewhat absorbed, and the latter assumed a faint bluish color; the left pupil dilated irregularly, especially at the temporal border, but the right pupil remained bound down in its original shape (fig. 1).

On the eighth day after admission the patient complained of rather severe

pain in the left eye and the feeling of a foreign body. Examination showed that there had occurred a sudden prolapse of the iris and ciliary body through a spontaneous rupture of the sclera near the limbus between the 2- and 5-o'clock position. There was a thin covering of episclera and conjunctiva over the bulging prolapse. The anterior chamber was not lost then nor at any future time. The tension, estimated with fingers, was increased though the eye appeared to be less congested. Atropine was discontinued and frequent instillations of eserine salicylate ordered in the hope of reducing the herniation, but it slowly increased in size to that shown in the drawing (fig. 2), and has remained so ever since. Aside, however, from the mechanical discomfort endured, the patient has had no complaints about the left eye; indeed, the widening of the pupil temporally due to the prolapse has so improved the vision (20/70), that this has become the better eye.

The laboratory reported, in the meantime, as to the blood chemistry and the differential blood count, both of which were normal; the conjunctival smears showed numerous lymphocytes but no eosinophiles; and the Wassermann test was four plus. The positive Wassermann in this case may have been due directly to the Vincent's infection of the gums rather than syphilis; however, antiluetic treatment was instituted and may have been beneficial in clearing up the gum infection. At the end of two months the blood test was negative. The Mantoux reaction (1:100,000 dilution) was strongly positive, but tuberculin injections were not given for fear of aggravating the chest condition.

X-ray films of the chest were very interesting. The July 18th report read: "Marked prominence of both hila, with infiltration from right hilum into upper lobe. The enlargement of the left hilum has a lobulated appearance suggestive of a glandular involvement. The findings are consistent with a hilar type of

* Read before the Brooklyn Ophthalmological Society, October 17, 1935.

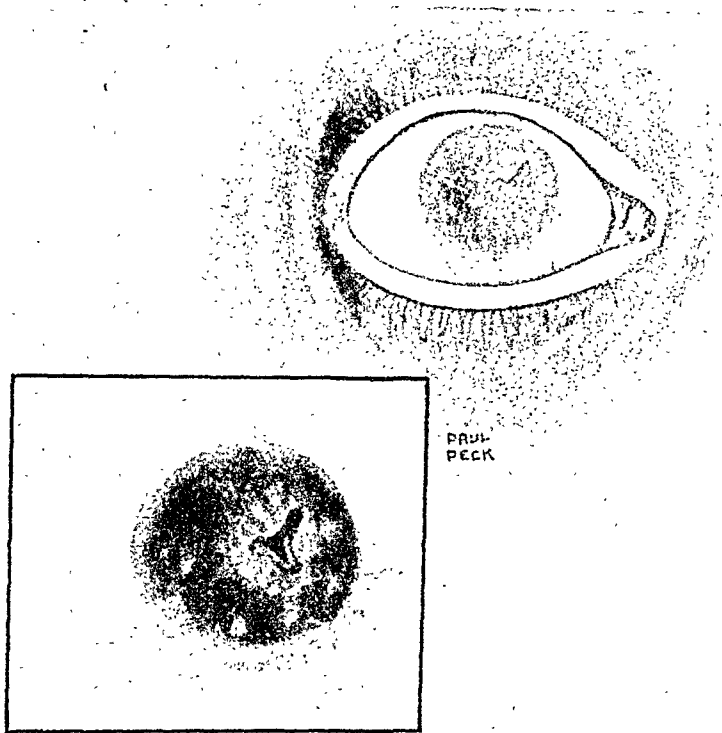


FIG. 1

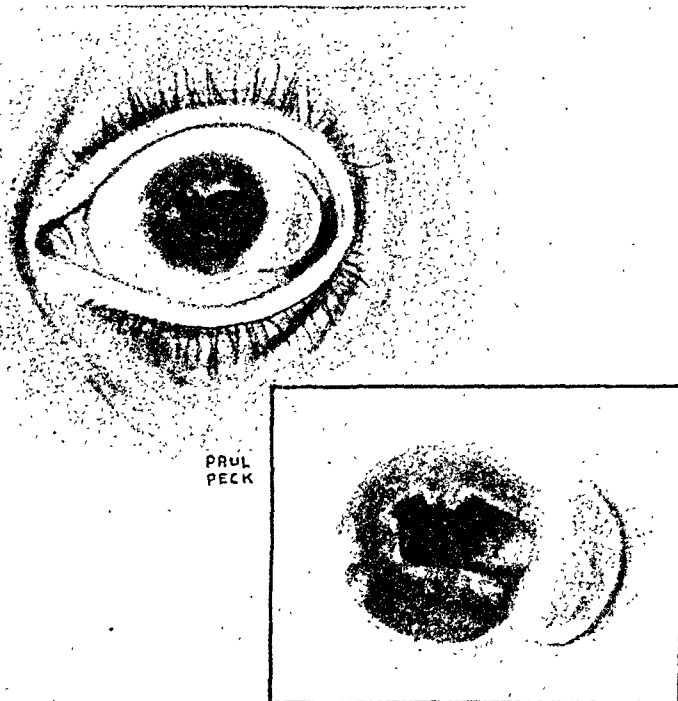


FIG. 2

Fig. 1 (Richman). Right eye. Shows condition present in both eyes at time of admission, leading to diagnosis of bilateral tuberculous iridocyclitis. This eye has remained unchanged; the left eye has changed as in figure 2.

Fig. 2 (Richman). Left eye. One week after admission, this prolapse of iris and ciliary body appeared through a spontaneous rupture of the sclera, evidently at the site of a caseous erosion. Condition still present.

tuberculosis, although not entirely characteristic." On July 25th the report was: "Bilateral mediastinal masses, as formerly described, are suggestive of lymphomatous type of new growth such as Hodgkins disease." On August 22nd: "Bilateral protrusion of both hila in the shape of spherical masses measuring from one to two inches in size, as associated with mediastinal tumor. Hodgkins disease must, therefore, be considered, although basal tuberculosis may be present." On October 10th: "Comparison with previous films reveals practically no change in the hilar infiltration on both sides, except for slight increase in density on the left side." The final opinion of the roentgenologist was that the patient had a juvenile type of hilar tuberculosis without any clinical signs. The sputum examination was repeatedly negative for tubercle bacilli.

In this connection, it is interesting to note the diagnosis of the patient's surgical condition made three years previously at the Long Island College Hospital, when an obstructing mass necessitated a resection of the jejunum from which the patient made an uneventful recovery. The laboratory reported the presence of giant cells in the microscopic section of the specimen, which established the diagnosis of "intestinal obstruction, tuberculous."

Though the facts in this case are complicated and unusual, certain findings warrant conclusions ascribing the spontaneous rupture of the sclera to a tuberculous lesion eroding through the limbus, the rupture, in turn, permitting herniation of the iris and ciliary body. These findings are: 1. The clinical diagnosis on admission of a bilateral tuberculous iridocyclitis; 2. The roentgenologist's diagnosis of a juvenile type of hilar tuberculosis; 3. The pathologist's diagnosis of a tuberculous intestinal involvement based on the finding of giant cells; 4. The fact that antisyphilitic treatment had no absorptive effect whatever on the masses present in the hila of the lungs, which would have been the case had the causative factor been a gumma.

No treatment for the tuberculosis

was given other than complete bed rest for three months and a high caloric diet rich in vitamins.

522 Ocean Avenue.

A MODIFIED CAPSULE FORCEPS FOR CATARACT EXTRACTION

CHARLES E. WALKER, JR., M.D.

DENVER

Many capsule forceps now on the market are very delicate. Even with careful handling, they soon lose their adjustment. The present modification of the Verhoeff forceps was devised to obtain a more substantial instrument which would be suitable for grasping the anterior capsule of the lens in the coloboma of the iris near the equator.

Recent reports indicate that the intracapsular-cataract extraction by the method of Dr. F. H. Verhoeff of Boston, is consistently superior to other methods reported. In order to use the present forceps successfully it is necessary to change the Verhoeff operation slightly. Briefly, after the usual section and iridectomy, the Verhoeff method consists of grasping the lens, after pressure is applied at the lower limbus. The lens is straddled, with the anterior blade of the forceps on the anterior capsule and the posterior blade on the posterior capsule, and is then rotated from side to side and slowly extracted with the aid of pressure below.

The modified forceps is held like a pencil. The capsule is wrinkled by pressure on the lens through the coloboma of the iris, and is grasped as near the equator as possible. The lens is lifted toward the cornea and out of the wound by means of pressure below at the limbus with the blunt end of a squint hook. Slight to-and-fro motion may be used in the delivery of the lens, care being taken to keep the posterior capsule close to the scleral lip of the wound.

Many lenses after removal in capsule, were subjected to the following test. Equal grasps were taken on the anterior surface of the lens near the equator with the modified forceps and by the method of straddling the equator with the original forceps. Almost in-

variably the capsule ruptured with the latter procedure. Although the lines of force on the extracted lens are not the same as on the lens in situ, it was thought that the new method had some advantage.

A sufficient series of patients has not been operated on to make any statistical report of value, but to date the method appears to have as high a per-



Fig. 1 (C. E. Walker, Jr.). Capsule forceps for cataract extraction.

centage of successes as the published results of the original operation. It does have the advantage of being a simpler operation with forceps which remain in adjustment for a longer time.

The forceps is now made by V. Mueller and Company of Chicago.
1114 Republic Building.

AN UNUSUAL CASE OF BILATERAL RETINAL DETACHMENT

Operation by the Safar method

DOHRMANN K. PISCHEL, M.D.
SAN FRANCISCO

This case of bilateral traumatic detachment of the retina is briefly presented because of its very unusual history together with a successful operative result in a case of long-standing detachment.

The patient is a 46-year-old lumberman. On May 31, 1932, he was struck over the right eye by a knot of wood with sufficient force to knock him down. The vision gradually failed, and two months later an examination by an eye physician revealed the presence of a detachment of the retina involving at that time the outer lower quadrant. Subsequently the vision decreased still more, and the detachment increased, but the patient had nothing further done for the eye, which became practically blind.

On March 1, 1933, nearly a year later, he was struck in the left eye (the good eye) by the limb of a tree. He was painfully injured and was treated by an

ophthalmologist who reported a perforating injury of the left cornea with prolapse of the iris and an anterior chamber full of blood. After appropriate treatment he was discharged with vision of 15/20. This gradually decreased, however, so that by March, 1934, he was practically blind in that eye also.

Examination of May 25, 1934, showed the following: O.D., externally essentially negative; O.S., an adherent leucoma towards the 10:30-o'clock position with distorted pupil, and small opacity occupying the nasal superior part of lens.

There was a total detachment of the retina of the right eye, rising very sharply from the disc. Temporal and below, between the 7:30- and 10-o'clock position there was a long disinsertion of the ora serrata but no other holes were visible. In the left eye there also was a total detachment of the retina with a similar long disinsertion of the ora serrata, from the 2:30- to 5:30-o'clock position. Vision of the right eye was ability to count figures at 30 cm. and of the left eye finger counting at 35 cm. It was not possible to measure the fields.

On May 28, 1934, fourteen months after the injury, the left, or more recently injured eye was operated on. A Safar multiple-diathermy-puncture operation was performed: 37 pins inserted in a double row in a crescent enclosing the disinsertion. There was uneventful convalescence. The retina reattached completely; six weeks later vision was 15/70 and a normal field was found.

On September 20, 1934, the right eye was operated on, two years and four months after the accident to that eye. A Safar multiple-diathermy-puncture operation was performed: 48 pins inserted in a double row in a crescent enclosing the disinsertion. Again an uneventful convalescence followed. The retina reattached, and the field became normal, vision being 15/100 one month later.

Examination May 21, 1935, showed complete reattachment of both retinæ. Vision of the right eye (which had had a detachment for two-and-one-third years) with correction was 15/50, J. 1; of the left eye (which had had a detachment for one year and a traumatic cat-

aract due to a perforating injury) with correction was 15/100, J. 5. The patient was performing his usual work and driving a car.

Summary

This case presents several unusual features: bilateral traumatic total detachment with almost symmetrically placed oral disinsertions (i.e., in the temporal inferior quadrant in each eye); complete healing of a detachment which had existed over two years and four months and with remarkable vision of 15/50; complete healing of a detachment in an eye with a perforating injury which had injured the iris and lens causing a traumatic cataract.

This should lead to a more optimistic outlook than has prevailed in dealing with cases of over a few months' duration and one should be led to try operations even in cases of very long standing.

Medico-Dental Building.

EYE COMPLICATIONS FOLLOWING THE USE OF REDUCING AGENTS

WILBER F. SWETT, M.D.
SAN FRANCISCO

In a relatively small series of cases presenting eye complications following the use of reducing agents the following four show a marked variation from the usual pathology reported in the literature and are exceedingly interesting for this fact.

Case 1. Mrs. G. L. B., aged 24 years, was first seen by me early in 1932, and her eyes were found to be perfectly normal. She had been pregnant in 1931, and after delivery of her child became quite stout. For this reason she was placed on a strenuous diet and took several bottles of thyro-pituitary compound (Coles Endocrine Compound #19). This compound contained half a grain of thyroid and an eighth of a grain of pituitary extract to a capsule. She took three or four capsules a day. On March 1, 1932, she noticed that the vision of the right eye was rapidly failing and of the left eye blurred. I examined her on March

5th, and found the vision in the right eye reduced to 20/100; that of the left eye, 20/20. Both optic discs showed temporal paleness, the right slightly more than the left. The visual fields disclosed a right homonymous hemianopsia, which was complete in the right eye, but only a moderate peripheral nasal contraction in the left eye.

The patient was immediately given a normal diet, and all medication was stopped. She was seen again on March 9th at which time the vision of the right eye had dropped to 20/200; that of the left eye had improved to 20/20. From March 9th to March 16th the vision and the hemianopsia recovered very rapidly and by April 16th the right eye had returned to normal. The patient has been seen regularly since that time and the condition has never recurred. This would definitely rule out pituitary disease. I believe that in this case the medication resulted in a temporary swelling of the pituitary body, which caused the right homonymous hemianopsia and which ceased as soon as the medication was terminated.

Case 2. Miss A. M. T., aged 45 years, consulted me on November 9, 1934, with the history of failing vision in both eyes for two months. Previous to this period, she claimed, her eyes had been examined and found normal. In October 1933, due to excess weight she was given dinitrophenol in increasing doses. She continued this medication at the rate of about four capsules a day until August, 1934, at which time, due to the fact that she had lost very little weight, she discontinued the use of the medication. At the time of my first examination her vision was reduced to 20/100 in both eyes, correctable to 20/40 part by a -3.0 D. sph. Her pupils were dilated and dense nuclear cataracts in both lenses were seen. The size and density of the nuclear opacity rapidly increased until February, 1935, at which time the cortex became involved and the lens became rapidly mature. The left lens was removed March 13, 1935, and the right lens on June 4, 1935. Both cataracts started clinically by a sclerosis of the lens nucleus which proceeded until the whole lens was in-

volved. This picture is just opposite to the classical one of developing cataract in patients who had received dinitrophenol, but the progress was much more rapid than in the usual cases of nuclear sclerosis. Due to the density and size of the nucleus, both eyes were operated on by the Hess method of combined extraction with excellent results.

Case 3. A young, married, Italian woman of 34 years had been rapidly gaining in weight and consulted her physician who placed her on a rigid diet combined with small doses of dinitrophenol (one capsule three times a day). The third or fourth day after starting treatment she broke out with what she described as a "measles rash" over her entire body but did not consult her physician. Thinking the condition was a mild case of measles she remained at home and continued her treatment. Three days later when the doctor was finally called she was found to have an extensive desquamative dermatitis which became rapidly so severe that not only the surface epithelium was shed but the mucous lining of the intestines, colon, vagina, mouth, and nasal cavities also sloughed. The conjunctivae of both eyes were so badly involved that the right eye developed almost complete symblepharon with ultimate loss of the right eye. The left eye, very fortunately, completely recovered, only a slight atrophy of the conjunctival tissues remaining. Due to the intestinal condition, the patient was not expected to live but finally made a complete recovery, except for the loss of the right eye, symblepharon of the right eye, and atresia of the vagina. Several plastic operations were attempted to correct the symblepharon of the right eye but due to the cicatricial changes in the cornea, which constantly ulcerated, the eye finally had to be enucleated.

Case 4. A school teacher, aged 41 years, owing to increased weight, took dinitrophenol from January, 1934, to April, 1934, inclusive. She first noticed dimness of vision in her right eye on March 20, 1935, and consulted me on April 28, 1935. During this relatively short period her vision dropped from

normal in both eyes to the ability to detect hand movements at two feet in the right eye and 20/40 part in the left. The swelling of the right lens progressed so rapidly that on June 20th, she was threatened with a secondary glaucoma. The right eye was operated upon the same day. Due to the fact that the lens was large, swollen, and soft in appearance I performed a linear extraction, which is my usual procedure for this type of cataract. The end result in operating by this method is so perfect that the eye appears as though it had never been touched.

The left eye followed the usual course of this type of cataract, showing the "cloth-of-gold" or "hammered-copper" appearance of the lens capsule with the opalescent general clouding of the whole lens substance. This lens is maturing so slowly that there is no danger of secondary glaucoma at the present time and will be operated on at the patient's convenience. The left eye in this individual may be taken as the usual type found in cataracts following the use of dinitrophenol.

The four different pictures presented by these cases show the dangers which may be encountered in using large doses of reducing agents indiscriminately and particularly in conjunction with drastically reduced diets.

Summary

The first case was particularly interesting and showed that large doses of pituitary medication can cause an acute swelling of the hypophysis to such an extent as to result in an acute homonymous hemianopsia. The second case demonstrates that following the use of dinitrophenol the lens change may originate in the nucleus instead of in the capsule. The third case demonstrates an extreme toxic reaction, evidently in a susceptible individual, with disastrous results. The fourth case, which is more or less typical of the cases so far reported in the literature following the use of dinitrophenol, demonstrates the speed with which a secondary glaucoma may develop.

490 Post Street.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLORADO OPHTHALMOLOGICAL SOCIETY

October 19, 1935

Dr. G. H. Stine, presiding

Cataracts following the use of dinitrophenol

Dr. V. H. Brobeck presented the case of M. S., aged 24 years, whose family history was irrelevant. She had been working as a telephone operator for seven years and was not exposed to any particular industrial hazards.

In February, 1934, she was given dinitrophenol for obesity. The dosage consisted of three milligrams per kilo of body weight daily. Prior to the ingestion of the dinitrophenol she had had a few injections of thyroactin for weight reduction, but this was discontinued in favor of the dinitrophenol. After taking the drug for about twelve weeks and losing approximately three pounds a week, she began to complain of periods of excessive weakness with perspiration. She could not tolerate bed covers over her in extremely cold weather, had severe backache with dyspnea, especially at night, and complained that her skin felt very dry and that she had paresthesias of the extremities. She discontinued the drug after losing about thirty-five pounds. In April, 1935, one year later, having some capsules left, she took another course of them over a period of two weeks.

The patient first consulted Dr. Brobeck on September 28, 1935, complaining of rapid loss of vision dating back about three weeks. Her physical examination was essentially negative with the exception of the ocular condition.

The patient was given pilocarpine three times daily for the slight increase in pressure to tide her over the intumescent stage of the cataract. It would have been obviously difficult to operate on the patient at the time of presentation because of the shallow anterior chambers.

Discussion. Dr. J. M. Shields said he had had a similar case in which cataracts developed about a year after the ingestion of dinitrophenol. Linear extraction was successfully performed.

Dr. W. H. Crisp recommended a preliminary capsulotomy after the method of Homer Smith a few hours prior to an extracapsular extraction.

Dr. C. E. Walker, Jr., expressed the opinion that an intracapsular operation should be performed in the near future. He advised the Verhoeff method which was safe and yielded a high percentage of good results.

Dr. Melville Black said that one might use in this case a Ziegler dissection followed by a linear extraction if necessary, or an intracapsular extraction.

Dr. V. H. Brobeck said that Dr. Safar used intracapsular extraction in young people.

Anterior choroiditis, probably tuberculous

Dr. George H. Stine presented the case of Mr. R. H., aged 31 years, who was first seen on May 28, 1935, complaining of sudden clouding of the vision in the left eye, two weeks before. There was no pain nor redness of the eye. The patient had had an attack of choroiditis in the same eye three years before, which was considered tuberculous. The treatment at that time consisted of subconjunctival injections and iodine internally, by another oculist; it was followed by activation of pulmonary tuberculosis and sloughing of the cavity. The pulmonary and intestinal tuberculosis was now in the quiescent stage. The vision of the right eye had been very poor for the past twenty years following macular choroiditis. The vision of the right eye was 0.08, of the left, 0.2.

The right eye showed a large dense vitreous strand extending backward. In the macula was a dense, white, depressed, choroiditic spot with faint,

reddish stripes in the center, surrounded by a grayish pigmented area, the entire mass being about $1\frac{1}{2}$ disc diameter in size. There were many tiny, hard, white, pin-point dots around this area. This was diagnosed as a healed choroidal tubercle.

The left eye was externally normal except for a few cells on the posterior corneal surface and in the aqueous. There was a dense cloud in the vitreous composed of fine grayish-brown dust. In the next few days when the vitreous became clearer, a diffuse, white, not definitely elevated opacity, one disc diameter in size was seen two disc diameters above the disc. There was a healed, atrophic, choroiditic patch in the upper temporal fundus. The entire retina had a hard, glistening sheen which still persisted. There had been perivascular sheathing along the retinal veins in the nasal periphery, but this had now disappeared.

There was a positive local reaction to an intradermal test of .01 mgm. O. T., but no focal reaction. An X-ray film of the sinuses showed cloudy left ethmoids and a large polyp in the right antrum. The teeth were found to be negative, as was the blood Wassermann. Sinus surgery was considered, but it was resolved to try tuberculin therapy and mild X-ray radiation of the eye first. A few K.P. showing mutton-fat characteristics appeared two days after the positive O. T. reaction. Mild X-ray treatment was started on the tenth day of service with marked clearing of the vitreous and improvement in the vision to 0.5 two days later. Only two injections of B.E. with the largest dose $1/20,000$ mgm. were given in order to control the results of the X-ray therapy more definitely. The usual local treatment of the eye with atropine, dionin, and heat was instituted.

The eye was quiet by July 22, 1935 (eight weeks). Atropine was stopped the middle of August, and the vision was 1.2 plus. A few small, nodular, vitreous opacities were still present. Some shrinkage of the vitreous was shown by the slitlamp and a plano contact glass. There had been no recur-

rence of the trouble at the time of presentation. The patient was taking sun baths with a general physical improvement.

Discussion. Dr. W. H. Crisp said that X-ray therapy should be thought of in any case of slow healing. Cases of sluggish keratitis sometimes responded to the X ray.

Dr. Hugo Lucic said that neosalvarsan might be of benefit in some cases in which there was no response from tuberculin and the Wassermann was negative.

Dr. J. M. Shields questioned if every case of cataract following the use of the X ray was due solely to that cause. He cited two cases of malignant acne in patients aged 35 years and 50 years, in which cataract formation followed X-ray treatment, and another case of acne, in which cataract developed although the X ray had not been used.

Acute glaucoma secondary to hypermature Morgagnian cataract

Dr. G. H. Stine presented the case of Mr. J. C. M., aged 70 years, who was first seen on July 29, 1935, complaining of redness and dull pain in the right eye for the past five days. Ten years ago he had had a cataract extraction from the left eye, and at that time an immature cataract of the right eye was diagnosed.

A general physical examination revealed a chronic pyelonephritis; nephrectomy was considered but not deemed advisable. There were infected teeth.

When the patient was first seen the ocular findings were typical of an acute glaucoma, but the anterior chamber was deep. There were no K.P. There was a milky-white, Morgagnian cataract with a yellow nucleus decentered downward. The tension, 76 mm. Hg (Schiotz), was reduced to 28 mm. in twenty-four hours by the use of eserine and paracentesis, and was held there for the first four days until a dense posterior synechia of the upper pupillary margin developed. This was easily ruptured by the use of scopolamine, cocaine, and two-percent suprarenin bitartrate, but the tension gradually

rose. Daily paracenteses gave only temporary relief. On August 5th, five infected teeth were removed.

Intracapsular cataract extraction with a narrow iridectomy was performed on August 8, 1935, without difficulty. The postoperative course was completely uneventful, with prompt recovery. The patient now used pilocarpine one percent twice daily. After the cataract extraction the tension had never been found to be above 30 mm. Hg. Vision with correction is 1.0, and there are no definite glaucomatous disc changes.

A hernia of the vitreous with a clearly visible hyaloid membrane was seen postoperatively. On August 28th the hernia had lessened and there was a small vertically oval hole in the hyaloid membrane through which a few strands of vitreous structure protruded into the anterior chamber.

Discussion. Dr. J. M. Shields questioned the accuracy of tonometric readings after a cataract section of the cornea.

Dr. W. H. Crisp said that a tension of 30 on the new Schiötz is a high normal, and that one should question the absence of glaucoma if tonometric readings are no lower than this.

Dr. C. E. Walker, Jr., cited three cases similar to this, one in which the tension was controlled by preliminary iridectomy. Cataract extraction was accomplished later.

Traumatic paralysis of the left superior oblique following the removal of an anterior ethmoid mucocoele

Dr. G. H. Stine presented the case of R. P., aged 12 years, who was first seen on January 11, 1934. At that time there was some swelling in the upper inner angle of the left orbit with proptosis and variable diplopia. The patient was seen again on August 1, 1935, following the removal of a mucocoele about a year previously. His complaint at this visit was double vision with shoulder tipping, general nervousness, and irritability since the operation.

The patient was found to have twenty-two centrads of left hyperphor-

ia and four centrads of exophoria, increasing on looking downward, down and to the right, and to the right. Diplopia fields showed a paralysis of the left superior oblique, and probably some secondary spasm of the right inferior rectus. The refraction was tested and subjective diplopia corrected by prisms for the average primary position. The patient is now much more comfortable, and there is an improvement in the objective findings. An advancement of the left superior oblique after the method of Wheeler might be done at a later date.

Discussion. Dr. Melville Black said that if the surgeon made his incision in the brow and followed the periosteum, taking care to avoid the trochlea, paralysis of the superior oblique should not occur.

Dr. R. W. Danielson said that in many cases of frontal and ethmoidal mucocoele the surgeon could not avoid damaging the trochlea.

Dr. E. B. Swerdfefer said that the mucocoele might involve the muscle directly.

Dr. G. H. Stine said that the patient is now wearing the correction for ametropia combined with four centrads prism, base out, over the right eye and eight centrads, base down, over the left eye with perfect comfort. There was single vision with this correction, but the red glass before one eye caused diplopia which varied between four and seventeen centrads left hyperphoria. There was slight extorsion.

Syphilitic ophthalmoplegia of the left eye

Dr. E. B. Swerdfefer reported the case of F. C., a 30-year-old white man who entered the hospital on September 29, 1935, complaining of headache and left nasal discharge of nine months' duration. He had had pain in the left face and jaws which removal of all the teeth had failed to relieve. Three months before entry a blood Wassermann was reported positive at a C.C.C. Camp and he was given neoarsphenamine and bismuth for two months. He gave a history of chancre in 1915, which

was treated by cauterization. Four days after entry he developed ptosis and some failure of vision in the left eye.

Examination revealed an ill and emaciated man showing complete ptosis and complete ophthalmoplegia of the left eye. The left pupil was oval and slightly larger than the right, but both reacted to light. Ophthalmoscopic examination was checked by Dr. W. A. Ohmart and no pathology of the disc or fundus was found. There were no visual-field abnormalities in either eye. The frontal sinuses and left antrum transilluminated poorly and an X-ray examination showed a chronic infection in these sinuses. The knee jerks were not elicited. The Wassermann report on the spinal fluid was four plus.

The patient was given potassium iodide and bismuth but continued to go down hill. He continued to complain of pain in the left face, and was troubled by some thickness of his speech. About two weeks after admission he began coughing and raising considerable sputum. An X-ray film showed old tuberculosis at the apices, and a diffuse opacity of the right-lower-lung field was interpreted as either syphilis, a tumor, or tuberculous pneumonia. An X-ray film of the skull showed no evidence of metastatic malignancy, but did show an osteoporosis which may have been syphilitic. He went downhill rapidly, lost much weight, and became completely blind in the left eye. He died on November 15, 1935, and as relatives could not be consulted, no autopsy was obtained.

George H. Stine,
Recorder.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

December 19, 1935

Dr. J. Milton Griscom, chairman

Some remarks concerning a pituitary adenoma of long duration

Dr. George E. deSchweinitz and Dr. A. G. Fewell presented the case of

Mr. W. H. D., aged 55 years, who complained of progressive loss of vision for about six months. The vision in the right eye at the time of examination, October 9, 1935, was 6/30 and in the left eye 6/9. For years he had suffered from headaches. Both discs showed simple optic atrophy of the type which suggests pituitary dysfunction. The visual field for form was somewhat concentrically contracted in both eyes. There was a large centro-caecal scotoma for red in the right eye. In the left eye the lower nasal field was entirely absent. This blind area was connected with a very much enlarged blind spot. There was a bi-temporal hemianopsia for red. X-ray films showed a lesion which largely destroyed the pituitary fossa. The dorsum sella and posterior clinoids had disappeared. The right anterior clinoid was intact, whereas the left seemed elevated. X-ray treatments were tried for a time but this upset the patient, inducing violent nausea, and had to be discontinued. Dr. Frazier at the University Hospital operated and found a large adenoma of the pituitary extending into the posterior fossa. This was removed. It was thought that the tumor must have been present for at least seven or eight years. The patient did well for a time following operation but unfortunately developed pneumonia and died.

Discussion. Dr. Walter I. Lillie described a unique experience related to him by Dr. A. W. Adson. During the removal of the intrasellar portion of a pituitary tumor, his patient spontaneously remarked that she was experiencing the deep-seated centrally located headache which was the characteristic pain before operation. This type of headache is probably due to intrasellar pressure on the dura.

Exhibition of a case showing sequelae of interstitial keratitis with retinal exudate and massive hemorrhage

Dr. William Zentmayer presented the case of a girl, 11 years of age, with a plus-four Wassermann reaction. In the right eye there was an acute inter-

stitial keratitis with vision reduced to light perception. Detailed study of the fundus was not possible, but there appeared to be a large hemorrhage between the disc and the macula.

Two months later the vision in the left eye suddenly fell to 6/60. There was no evidence of keratitis. A circumscribed exudate was observed above the macula with a large hemorrhage at the lower border involving the fovea.

At the present time in the right fundus there is a vertical linear scar averaging about three vessel diameters in width and about three disc diameters in length, situated about one-and-one-half disc diameters from the temporal border of the disc. The central portion is white, and the borders on either side are densely pigmented. The upper portion flares somewhat and is covered by some overlying proliferative tissue. At the equator, paralleling the branch of the inferior temporal artery, there is a ribbonlike band paler than the surrounding fundus, probably a sclerosing choroidal vessel.

In the left eye, just above the fovea, is a perfectly round greenish-white atrophic area, one disc diameter across, with a rather dense pigmented border. Fine retinal vessels are made out on its surface. There is some proliferation over the lower portion of the lesion.

Corrected vision is 6/12 part in the right eye and 6/60 in the left eye.

Lupus erythematosus of the eyelids and conjunctiva

Dr. Perce DeLong and Dr. Joseph W. Klauder presented a 27-year-old white woman who had had the condition about one year. There were discoid patches of lupus erythematosus on the forehead, nose, and each side of the face, and both lids of both eyes were involved. These areas were atrophic, slightly red, and at places covered with fine adherent scales. The entire margins of the lids of both eyes were involved; the cilia were absent, the surfaces very dry and irregular. The conjunctiva of the lower lid of the right eye was involved with lupus erythematosus. The conjunctiva was elevated, smooth, and glistening, with

a velvetlike edema. The color was dark red with a purplish hue. On the posterior aspect of the right buccal mucosa was a sharply margined patch. The periphery was slightly elevated and violaceous; fine vessels ran over the periphery onto the normal mucosa. There was complaint of a burning sensation of both eyes with mucoid discharge.

During the past six months bismuth intramuscularly has been administered. The improvement following this therapy has been about fifty percent.

Argyria of the conjunctiva

Dr. Perce DeLong and Dr. Joseph V. Klauder presented a white woman, aged 39 years, who at intervals for four or five years had used argyrol in the eye in treatment of corneal ulcer as part of an acne rosacea. She also instilled argyrol into the nose whenever she had a cold. The mouth, tongue, gums, and skin showed no discoloration. The conjunctivae of both eyes were slate colored, appearing as though ink had been dropped into the sac.

A. G. Fewell,
Clerk.

WASHINGTON, D.C., OPHTHALMOLOGICAL SOCIETY

January 6, 1936

Dr. James N. Greear, Jr., president
Sight-saving classes in the public schools of the District of Columbia

Dr. Frank D. Costenbader said that it had been estimated that one child in every 500 to 1,000 should be in a sight-saving class in order not to have to compete with those of normal visual acuity. There are approximately only 45 children being cared for in these classes in the District and according to the statistics at least 90 should be having the benefit of this type of education. This means that these youngsters have been overlooked and that the duty of the ophthalmologist therefore is to consider more carefully such cases when they are brought to his attention. The types of visual defectives that belong in these classes are those with corneal scarring or retinal damage that has re-

duced the vision to less than 20/70. The methods employed in teaching these children are interesting: Large clear type is used; yellow crayon is furnished for the blackboards; there is a special lighting system and the children are taught the touch system on the typewriter from the second grade up.

The screen test and its applications

Dr. James Watson White presented a paper on this subject which has been published in this Journal (August, 1936).

Discussion. Dr. William Thornwall Davis said that it is obvious that a careful study of strabismus cases must be made before surgery is performed and that Dr. White's method of studying cases in all fields had revealed facts of tremendous value in these difficult cases.

Esotropia and right hyperphoria

Dr. Frank D. Costenbader presented M. R., aged seven years, who had esotropia and right hyperphoria. The refraction measured O.D. +3.50 D. sph. \ominus +1.75 D. cyl. ax. 90° and O.S. +2.00 D. sph. \ominus +2.25 D. cyl. ax. 90°. With this correction vision was 20/50 in each eye. Orthoptic training had been attempted, showing rapid alternation at first, but very shortly a fair third-degree fusion developed. There was an early tendency to false projection which was later overcome. Four months later the following peculiar measurements were obtained. When looking straight up there was an exotropia of 12 diopters and right hyperphoria of 8 to 10 diopters. In the primary position for near there was an esotropia of 4 diopters and right hyperphoria of 8 to 10 diopters. Looking straight down he had esotropia of 12 diopters and right hyperphoria of 8 diopters. A diagnosis of paresis of the left superior rectus was made and a marked accentuation of the normal tendency to diverge when looking up and to converge when looking down.

The second case presented was that of A. D., a five-year-old girl who had had an alternating convergent strabismus with spasms of both inferior ob-

liques. Under atropine cycloplegia she accepted +2.75 D. spheres with which vision was 20/20 in each eye. A fusion test revealed no simultaneous macular perception although the patient cooperated well. Measurement for near showed esotropia of about 80 diopters without glasses and 40 diopters with glasses. Six weeks later a four-millimeter recession of both medial recti was performed. Measurements shortly after operation showed an esotropia of 10 diopters for distance and 15 diopters for near, with glasses; 18 diopters for distance and 20 diopters for near without glasses. A double hyperphoria was found at this time. Second-degree fusion could now be elicited and intensive fusion training was begun. Six months later she had a fair third-degree fusion with some amplitude. Esotropia without glasses varied from 10 to 15 diopters and a double hyperphoria more marked on the left side was found. Measurement of the deviation in the six cardinal fields revealed a double inferior-rectus paresis.

Retinoblastoma

Dr. E. Leonard Goodman presented H. P., a white girl, aged four years, first seen May 12, 1934, with a retinoblastoma in the right eye. Enucleation of the right eye was performed on June 12, 1934, one centimeter of normal optic nerve being removed with the globe. Examination of the left eye while the patient was under anesthesia was negative for a similar growth. Microscopic examination of sections of the right eye confirmed the diagnosis of retinoblastoma. On November 14, 1934, a few globular grayish-white opacities, similar to those found in the right eye, were seen suspended by thin pedicles from the roof of the left eye. On extreme elevation of the globe a moderately large grayish mass was noted above and far forward in the left eye. A series of eleven daily X-ray treatments was given to the anterior aspect of this eye and a like amount to the lateral aspect. Radiation was fairly well tolerated although there was loss of the lashes and considerable erythema of the skin. Shortly after the last X-ray treatment

the growths suspended in the vitreous were observed to disintegrate and the parent growth became more difficult to see. Fourteen months following the institution of the X-ray therapy the vitreous was clear and there had been decided retraction of the grayish mass in the roof of the globe. The lashes had grown in again quite well and only a slight cutaneous erythema remained about the eye. The crystalline lens has continued to be entirely clear and there is no photophobia.

Retinal detachment

Dr. Ernest Sheppard presented a case of retinal detachment in the lower half of the left eye in a man, aged 33 years, with congenital nystagmus. On the advice of Professor Lindner of Vienna, intraocular operation was deferred until myomectomy of the median and lateral recti had been done. Reattachment resulted following this procedure, and has lasted six months. A week following the time this case was presented before the Society the upper temporal quadrant detached. The case was presented to show the value of immobilization as advised by Professor Lindner.

Ernest Sheppard,
Secretary.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

January 21, 1936

Dr. James J. Regan, presiding

Interpretation of the different forms of tuberculosis of the uveal tract

Dr. Francis Heed Adler said that statistics from different clinics vary considerably in the number of cases of inflammation of the uveal tract due to tuberculosis. This is due, in part, to the fact that there is no one characteristic picture of tuberculous uveitis. Illustrations from various standard textbooks often show great dissimilarity.

Experimental tuberculosis in animals varies in its clinical picture and course, due to a number of factors which have been well described in the literature. One of the most important of these is the allergic state of the animal to the protein of the tubercle bacillus. This allergic state may produce a diffuse, highly exudative lesion which has little in common with the characteristics of tuberculosis as usually seen, and which so masks the condition that the possibility of tuberculosis is not considered.

Virgil G. Casten,
Recorder.

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis

WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver

EDWARD JACKSON, Consulting Editor
Republic Building, Denver

HANS BARKAN
Stanford University Hospital, San Francisco

HARRY S. GRADLE
58 East Washington Street, Chicago

EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis

PARK LEWIS
454 Franklin Building, Buffalo

C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City

M. URIBE TRONCOSO
350 West 85th Street, New York

JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York

Address original papers, other scientific communications including correspondence, also books for review and reports of society proceedings to Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.

Exchange copies of medical journals should be sent to Dr. William H. Crisp, 530 Metropolitan Building, Denver.

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis. Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the manuscript editor. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

CORNEAL TRANSPLANTATION

Few fields of modern development possess more fascination for the popular mind and for the mind of the ophthalmologist than that of corneal transplantation, the attempt to replace opaque cornea with transparent cornea from another eye. The recent work of such men as Thomas, in England, and Castroviejo, in the United States, represents the relatively successful culmination of many earlier and less successful endeavors.

One of Nature's most regrettable imperfections is the failure to replace a highly differentiated structure with tissue of the same highly specialized kind after the original tissue has been destroyed. In the process of repair anywhere in the body the original structure is replaced by scar tissue, a fibrous structure of useful purpose but of primitive type. In the cornea the result is loss of that transparency which is

indispensable for the function of vision.

The likelihood that corneal transplantation will be practised by any very large number of ophthalmic surgeons is precluded on account of the many difficulties involved. Among these must be reckoned not merely the problem of finding a suitable donor but also the details of preliminary study, the many hazards involved in the patient's original injury or ocular ailment, and the niceties of operative and postoperative technique.

Rather more than a century ago Dieffenbach commented upon the few attempts at corneal transplantation that had then been made by saying that the graft would either fail to unite or would become opaque. Although in 1886, after twelve years' work, Hippel had claimed partial success with a method in which Descemet's membrane was left in place, Magitot stated in 1912 that one hundred years of effort had produced about

half a dozen successes; and in 1924 Parson's Textbook on Diseases of the Eye dismissed the matter in the following terms: "Keratoplasty, the excision of a disc of scarred cornea and its replacement by a disc of clear cornea from a rabbit's or human eye is practically never successful. The new tissue rapidly becomes opaque."

Hippel, and later Elschmig of Prague and Filatov of Moscow, used a mechanical trephine. Elschmig published in 1930 the result of thirty years' work, showing thirty-five clear grafts out of 176 cases. Twenty-three or more of his grafts failed even to unite.

The work of J. W. Tudor Thomas (several papers, but especially Transactions of the Ophthalmological Society of the United Kingdom, volume 55, page 114 and page 373) and of Ramon Castroviejo (see especially Archivos de Oftalmologia Hispano-Americanos, volume 35, page 404), while including rather small series of cases, seems to represent genuine advances in technique and a more hopeful outlook. Thomas even goes so far as to declare that in suitable cases there is a seventy-five percent chance of valuable improvement in vision. The eye most suitable for such an operation is naturally one which is normal except as to the presence of corneal opacity. Vascularity of the cornea does not seem to be a contraindication.

In the presence of an anterior synechia the graft always becomes opaque. Success is more probable if the transplant is surrounded by corneal areas which are not greatly affected by the cicatricial process. The favorable chances are reduced by the presence of very dense leucoma, by aphakia, by operative loss of vitreous, and by ocular hypertension. But Castroviejo remarks that, since in such cases vision is almost always limited to light perception and projection or to mere light perception, corneal transplantation should be performed because it is the only means of improving vision.

Complicating conditions are as far as possible to be eliminated before transplantation is undertaken. Thus, free iridectomy should be performed for an-

terior synechia, or a tendency to glaucoma should be remedied surgically. Attention to these matters after transplantation will usually fail to avoid an opaque graft.

As to the actual technique of operation, Thomas and Castroviejo differ. Both agree that the graft is not to be sutured to the surrounding cornea, and both insist on the importance of a shelving edge for excision and graft. But Castroviejo cuts a square graft which is first outlined with parallel knife blades and is completed with keratome and scissors, whereas Thomas makes a circular graft with a hand trephine followed by scissors. Castroviejo secures his graft in position by bringing together over the graft upper and lower conjunctival flaps; while Thomas retains the graft by means of sutures carried through the surrounding cornea and knotted across the graft in a sort of double Maltese cross. Both first dress the eye after six days, and both keep the patient in bed several weeks after operation.

Castroviejo's detailed account of his cases abounds in valuable hints as to causes of failure and requirements for success. His best case gave vision of twenty thirtieths in an eye that had previously been able to recognize only hand movements a few centimeters before the eye. The case was one of old trachomatous pannus in a patient of fifty-eight years. The second eye of the same patient gave relative failure because an anterior synechia had not been excised before the transplantation was undertaken, so that hypertension developed. The importance of a complete history of the patient's previous condition is illustrated by a patient who had a postoperative tonsillitis and gained no improvement in vision.

Various sources for obtaining the graft have been tried. Filatov especially has experimented as to the possibility of fairly prolonged preservation of cornea taken from the cadaver, in Ringier's or other solution at a temperature slightly above freezing point. Most grafts have been obtained from eyes enucleated for conditions such as intraocular tumor or painful glaucoma. But

the age of the donor and the condition of his ocular tissues have a material influence on the result of transplantation. For this reason Castroviejo has recently resorted to the use of eyes of fetuses beyond the sixth month of development. The number of enucleations of eyes whose cornea is in satisfactory condition is distinctly limited. Moreover, it seems reasonable to suppose that the younger the tissue the greater its vitality.

From the scientific viewpoint, Thomas had the singular good fortune of being able to study histologically the corneas of two eyes in which he had performed transplantation with marked success, in one patient six months and in the other three weeks before death from influenza and incurable carcinoma, respectively. The vision of the former had improved to six sixtieths (from counting fingers at fifteen inches). The latter patient (from counting fingers at six inches) had obtained a perfectly clear graft and vision which he described as perfect. In each eye there was a very slight transitional zone of operative scar tissue between the parenchyma of the graft and the surrounding cornea. The eye of the six-months' case showed a small opacity in the lower part of the graft, and this appeared to be due to the presence of new tissue beneath the graft's Descemet's membrane. The stroma of the graft was free from invasion by blood vessels.

W. H. Crisp.

OPTIMUM LIGHT

In our tests of vision we deal mostly with thresholds. With a Snellen test-card we seek the very lowest line the patient can see. With the broken ring, or the open square, we try for the greatest distance at which we can tell which way the opening is turned. In charting the field of vision, whether it is a 2 mm. or a 10 mm. square, we place the test object outside the field, and mark the point at which it becomes just visible. In laboratory testing for light perception, we start with complete darkness and note when the illuminated field becomes just visible. With color fields we seek the limit at which the color is first

correctly recognized. There are reasons for dealing with limits in these tests.

But when we seek the conditions most favorable to health, or recovery from disease, the problem is different. To utilize the sense of touch, to feel things, we do not want the hardest pressure that can be borne on the nerves nor the lightest touch that can be just perceived. We do not enjoy the sense of smell with heaviest odors, nor the perfume that is just perceptible. For music we do not want the loudest noise that can be borne nor the tone that can only be recognized by the closest attention. The solar spectrum, at either end, fades gradually into darkness, and the extreme limit is fixed for the infrared, or the ultraviolet, with great difficulty. Near the center of the spectrum the light is one hundred times brighter than that near the end. In choosing light to work by we must seek not the possible limits, the thresholds, but the optimum, the light which makes vision most easy, clear, and comfortable.

In choosing the optimum of light by which to work we must bear in mind the enormous range of light adaptation that is possible for human vision. After complete dark adaptation it is possible to notice the illumination of only a fraction of a foot-candle. But at noon of a bright day we may use the illumination of 10,000 foot-candles with comfort and visual efficiency for the perception of objects rendered small by distance such as mountain tops observed from the sea, animals moving on the desert, or distant smoke. We can do some useful things with dark-adapted eyes, but we can make out fine details, or see them most quickly, or easily, under good daylight illumination. It is easy to be misled into thinking that we can see just as well, or just as easily, in the light we have been accustomed to though it may not be a really good light for our seeing. The automatic adaptation of the eye fits it to make the best of what light we have, and we put up with it, without realizing that we could see much better with more light, and that the poor light is making the work far harder for the eye. A boy, who wanted to finish reading a book, kept on reading in the fading twilight.

He finished the book; but he stayed in a dark room for two weeks after that, and it was a month before he could read another book.

The eye physician who understands something of the adaptation of the eye, and who works a good deal with the testing of thresholds, is in danger of forgetting that what his patients need is the optimum—the best condition for eye work. By increasing the light on his test cards to double, or four times the usual he will always find the patient able to correct his mistakes, or read another line and may sometimes get him to read 12/6, instead of 6/6. Such an increase in light and sight will mean an enormous increase in the efficiency, comfort, and safety of his patient, if his patient is a bookkeeper, or a needlewoman. To advise better light to work by, may be a prescription troublesome and difficult for the patient to carry out, but it is often worth more to the patient than anything else that can be done for him, and may be correspondingly valuable to the prescriber who takes the trouble to see that it is carried out.

One thing more; a good light is one that comes in the right direction. Eclipse blinding proves to us that the sun is too bright to be looked at. The lamp of a lighthouse may be too bright to be looked at, unless it is seen on the horizon, ten or twenty miles away. When we start to motor in the mountains, with the sun on our backs, its 10,000 foot-candles, on the forests and canyons, is never too bright, but as we go west and the sun sinks low in the sky, we have to turn down the shade to save our eyes from its blinding light. The use of electric lights for ornament has confused the popular mind as to good lighting. They may be pretty and effective to look at, but they do not furnish a light to work by. The dread of bright light is the dread of having bright light shining on our eyes. The need for bright light is to have it shine on the thing we have to look at.

Edward Jackson.

SHORT COURSES FOR SPECIALISTS

Two of the annual, short, graduate courses in ophthalmology have just

been completed, one in Denver and the other in Rochester, New York. Both are examples of the best type of condensed course. The Denver course is probably the first of its kind, having been initiated by Dr. Edward Jackson fourteen years ago. It has always been popular and has been the model for its many successors. There are now at least a half dozen similar courses given throughout the country. Whether the supply will not shortly exceed the demand remains to be seen.

It has been interesting to note the type of individual in attendance. Most of them are in middle life or older. These physicians are unable to leave their practices for a prolonged period, but feel the desirability of refreshing themselves on the newer methods of diagnosis and treatment. They probably receive a considerable amount of benefit, justifying the time and effort expended by those who give the instruction and by themselves in attending. That sufficient well-trained physicians are willing to make the sacrifices necessary to give this instruction, especially those who come from considerable distances at a real loss of time and money, is a splendid commentary on the altruism of our profession.

The Denver course was well attended and well received. Under the leadership of Dr. Jackson there has developed locally a strong group of ophthalmologists capable of giving a high type of teaching. In this annual course they give generously of their time and energy.

Denver was not at its best, as Colorado has shared in the heat and drought that the Middle West suffered in June and July, but the registrants did not let the hot weather interfere with regular attendance and unflagging interest. The climax was, as usual, the Colorado Congress, which was held on Saturday, July 25th. Many interesting papers were read. Some of these will be published in this Journal.

We congratulate Dr. Jackson for his farsightedness in initiating this course and for his spirit of youth which has been the motivating force that has carried it on through fourteen successful years.

Lawrence T. Post.

BOOK NOTICES

La radiographie en ophtalmologie. Atlas clinique. By Prof. Edward Hartmann, 272 pages, 391 illustrations, cloth binding. Paris, Masson et Cie, French Ophthalmological Society, 1936, price not stated.

The French Ophthalmological Society annually presents to its members a volume of some modern work of exceptional value. Last year it was a review of the intracapsular operation for cataract, being a complete study of the work of various operators with conclusions as to the value of this method of operation.

That for 1936 consists of a magnificent octavo volume of 272 pages on finely surfaced paper on ophthalmic radiography. It is a clinical atlas prepared by Prof. Edward Hartmann of the Paris Hospitals and was presented at the annual meeting in Paris on May 12th of the present year, a rapidity of reproduction which is most creditable. It consists of a series of very excellent radiographs including the various positions of the face and orbits and of the sinuses with affections of the globe including

intraocular foreign bodies. Among the important plates are those of bony neoplasms, tumors of the orbit and adjacent regions, syphilitic growths, fractures, and radiographs of the lacrimal canals and of cerebral neoplasms involving the eyes. The radiographs of the different affections of the bones of the skull and face are exceptionally valuable including oxycephaly, hereditary cranial facial dysostoses, acrocephalosyndactylia, Paget's disease, neurofibromatoses involving the nasal sinuses, leontiasis ossea, the Schüller-Christian syndrome, and many other rare forms of osteal changes. The various techniques described with accuracy are those of Kohler, Dor, Belot, Fraudet, Holtzknecht, d'Altschul, Grudwinski, and also those of the Americans, Sweet and Dixon.

The volume forms a unique publication, the radiographs being beautifully delineated. The work should be in every radiographic laboratory as a basis of comparison, for such an array of rare pictures has never before been presented in any volume. It is very suitably dedicated to the memory of Prof. V. Morax.

Park Lewis.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, history
19. Anatomy, embryology, and comparative ophthalmology

9

CRYSTALLINE LENS

Chirkovskii, V. U., and Dimshitz, L. A. Morphology of cataracts caused by light energy. Awerbach jubilee volume, 1935, p. 578.

A report of two cases, one in a man 28 years old, and one year subsequent to therapeutic irradiation of the face; and the other in a boiler fireman 38 years old. Morphologically there is a similarity between the cataracts caused by infrared and radium rays, and both resemble saucer-shaped cataract. They are recognized by their location under the posterior capsule at the posterior pole, by their discoid form corresponding in size and shape to the pupil, and by their sharp demarcation from the clear portions of the lens. Capsular vacuoles, usually present in radium and X-ray cataracts and absent in glass-blower's cataract, are not a reliable diagnostic feature. The genesis of these cataracts is probably associated with disturbed nutrition of the lens, due to changes in the ocular vascular system, and injuries to the epithelium of the anterior capsule. The sensitiveness of the human lens to the action of light energy is much greater than is generally recognized. (Illustrations.)

Ray K. Daily.

Daniel, R. K. Allergy and cataracts. Trans. Sec. on Ophth., 1935, 86th annual session, pp. 50-55. (See Amer. Jour. Ophth., 1935, v. 18, Oct., p. 994.)

Denig, Rudolf. Removal of swollen lens remains after operation for immature senile cataract. Klin. M. f. Augenh., 1936, v. 96, April, p. 501.

If absorption of lens remains seems doubtful on account of its quantity, it ought to be removed within the first week after operation. Denig reopens the wound under the protection of a conjunctival bridge, an essential part of his method of cataract operation as here described. C. Zimmermann.

Dimshitz, L. A. Morphology of cataract associated with neurodermatitis. Awerbach jubilee volume, 1935, p. 128.

The author reports the ninth case in the literature. The patient was 28 years old, and the cataract consisted of a progressive opacity of the anterior pole of the lens immediately under the lens capsule. The first visual disturbances appeared seven years after the appearance of the skin lesions. The author believes that inasmuch as the cutaneous lesions have a neurotic basis, a neurodystrophy may be the etiologic factor in the development of the cataract. (Illustrations.)

Ray K. Daily.

Ellett, E. C. The results of cataract extraction five years and more after operation. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 341-352.

To obtain accurate information on the permanent visual results of cataract extraction the author studied 188 cases, including only those that had been under observation for from five to thirty years. Some of the more common causes of loss of vision are discussed and eleven case reports are included as to patients who did not retain useful vision. The loss was due to various causes and occurred at varying intervals after operation. C. Allen Dickey.

Esteban, Mario. Concerning heat cataract. *Rev. Cubana-Oto-Neuro-Oft.*, 1936, v. 5, Jan.-Feb., p. 30.

Among some fifty blacksmiths the writer has observed two cataracts in persons of 47 and 50 years respectively, and wonders whether they were not occupational infrared cataracts.

M. Davidson.

Friedman, S. I. A modified conjunctival suture in cataract extraction. *Awerbach jubilee volume*, 1935, p. 566.

This suture, introduced before the eyeball is opened, brings together the edges of a horizontal conjunctival incision 2 to 3 mm. in length made 2 to 3 mm. above the limbus. (Illustrations.)

Ray K. Daily.

Greenwood, A., and Grossman, H. P. An analysis of 1,343 intracapsular cataract extractions by 48 operators following the Verhoeff method. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 353-364.

In this series of unselected cases the Verhoeff method was used by operators of varying experience. The capsule was ruptured in about five percent and vitreous was lost in six percent. This method can be employed successfully in all cases of cataract other than juvenile and traumatic. C. Allen Dickey.

Grosz, E. de. Cataract extraction in 15,000 operations. *Arch. d'Ophth.*, 1936, v. 53, March, p. 161.

The paper is an analysis of experi-

ences in 15,050 operations for senile cataract over a period of thirty years.

Loss of vitreous occurred in 2.5 percent (1 percent in the extracapsular method, 4 percent in the intracapsular). Since retrobulbar injection of novocaine has been used the percentage of vitreous loss has declined. Postoperative infection declined from 1 percent during the first ten years to 0.4 percent in 1932. Strangely enough, the percentage of expulsive hemorrhage has increased from 0.08 to 0.59 percent since the use of retrobulbar injections.

Derrick Vail.

Kaminskaia, Z. A. Clinical forms of senile cataract. *Awerbach jubilee volume*, 1935, p. 187.

A review of the literature and a classification of one hundred cases studied with the corneal microscope. The author divides cataracts into cortical, nuclear, and saucer-shaped. The study shows that in cortical cataracts the posterior cortex is most frequently involved; in relation to the slitlamp picture of this type of cataract, the subjective disturbances and reduction in visual acuity are amazingly mild. Saucer-shaped cataract the author cannot differentiate from complicated cataract, but the subjective disturbances are greater in proportion to the objective findings. Nuclear cataracts are characterized by absence of water clefts and disintegration of the lens. The author believes the various types of cataract probably have different etiologic factors. She considers saucer-shaped cataract related to the toxic and complicated type. Nuclear cataract may be purely a senile process, while posterior cortical cataract may be accounted for by some disturbance in the retrolental space.

Ray K. Daily.

Markiewicz, Stanislaw. Comments on the Arruga and Hess forceps. *Klinika Oczna*, 1936, v. 14, pt. 1, p. 63.

The author has modified the Arruga forceps so that they close only posteriorly, while the anterior edges remain apart. This was done to avoid including the iris in the grasp of the forceps when they are passed behind the

iris to grasp the lens capsule. The author has also modified the curved ends of the Hess iris forceps, making manipulation simpler. (Illustrations.)

Ray K. Daily.

Müller, H. K. The amount of acid-soluble organic phosphate in the healthy and diseased lens. *Arch. f. Augenh.*, 1936, v. 109, May, p. 497.

The investigations reveal that the lens loses with age and with the formation of cataract not only vitamin C but also its acid-soluble carbohydrate phosphate. Whereas the lenses of young cattle had 9.6 mg. inorganic and 32.3 mg. organic phosphate, the lenses of old cattle contained 8.8 mg. inorganic and 27.5 mg. organic phosphate. In the very opaque lenses the amount of organic phosphate was greatly reduced and in three cases none was found. The less opaque lens, too, showed a distinct decrease of organic phosphate. It is noteworthy that the inorganic phosphate was present in normal values and only exceptionally was it found increased or decreased. The author argues that the above findings give additional proof of his contention that the lens produces vitamin C from sugar with the aid of carbohydrate phosphate.

R. Grunfeld.

O'Brien, C. S. Detachment of the choroid after cataract extraction. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 325-341. (See *Amer. Jour. Ophth.*, 1936, v. 19, Feb., p. 182.)

Ramirez Corria, C. M., Cuervo, L. V., and Manas, R. M. A case of tetany and juvenile cataract from parathyroid insufficiency. *Rev. Cubana Oto-Neuro-Oft.*, 1936, v. 5, Jan.-Feb., p. 14.

The case reported is considered secondary to hypophysis insufficiency because of the coexistence of infantilism.

M. Davidson.

Reiser, K. A. On lenticonus posterior. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 641.

A case of lenticonus posterior in the right eye of a man of 37 years is described. Skiascopy indicated myopia of

3 D. in the normally curved peripheral parts of the lens and —16 D. in the area of the lenticonus. The slitlamp findings are illustrated, including remnants of the hyaloid artery and of the embryonic tunica vasculosa lentis. The literature, including 55 cases, is reviewed. The author regards lenticonus as an independent malformation of unknown origin. (Illustrations.)

C. Zimmermann.

Sourdille, P. G. Intracapsular extraction of the lens. *Awerbach jubilee volume*, 1935, p. 450.

An analysis of the results of 144 operations. In contradistinction to Pischel's statistics the author demonstrates that intracapsular extraction is the best method of extraction relative to visual results.

Ray K. Daily.

Vajda, Geza v. Cataract operations of the ophthalmic surgeon in the country. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 673.

Vajda describes the technique of his cataract operations on 480 eyes in the last six years, with statistics. He prefers bilateral operations in one sitting and extraction within the capsule.

C. Zimmermann.

Vogt, Alfred. A focal lamp for after-cataract operations. *Zeit. f. Augenh.*, 1936, v. 89, May, p. 140.

The slitlamp makes possible accurate observations of the thickness and nature of pupillary membranes and aids materially in deciding where to incise such a membrane. The importance of seeing all such details at the time of operation can hardly be overemphasized, and it is impossible with available lamps. Vogt, therefore, has designed a lamp (made by Zeiss) which projects a bright, real aerial image of an incandescent lamp filament into the plane of the membrane. He has used it in thirty operations and finds the illumination appreciably better than that given by any other lamp, in particular the Nitra-Hammer lamp.

F. Herbert Haessler.

Weeks, W. W. Complicated after-cataract: its surgical treatment. *Trans.*

Amer. Ophth. Soc., 1935, v. 33, pp. 559-571.

Complicated after-cataract is described and the indications for operative interference are given. The de Wecker procedure is described in detail. The keratome incision is made just inside the limbus and the membrane is cut with a de Wecker scissors. Two cases are reported in which this method was used successfully.

C. Allen Dickey.

Wölfflin, E. Two family trees of lamellar-cataract families. *Zeit. f. Augenh.*, 1936, v. 89, May, p. 129.

In the first of the two families, lamellar cataract occurred in eight members of five generations. The first three generations have been reported by Hosch in an inaccessible source. The first member was born in 1821 and was operated on successfully by an itinerant French oculist in 1829 (according to the statement of his still living 93-year-old son). This son was the only one of five children to be afflicted. Of his ten children, three daughters were similarly afflicted, and of the three children of one of them a son and a daughter had lamellar cataract. The latter has one affected daughter and two normal children. The father and grandfather of the first member of the family tree are said to have had normal eyes. Once the lesion appeared in the family, it seems to have been inherited as a dominant characteristic. It was transmitted only by an affected person and from male or female to male or female indiscriminately. These patients were free from rickets and spasmophilia but in all of the last five members striking horizontal nystagmus was present.

The second family tree involves only three generations. A female who became blind by her sixteenth year was successfully operated on for lamellar cataract. Of her seven children, one boy and one girl had lamellar cataract and no rickets or spasmophilia. The only daughter of the afflicted female of the second generation had cataract but not of the lamellar type. A ring of punctate opacities involved the posterior cortex. Later a few spicules developed anterior

to the punctate opacities but the equatorial and anterior cortex always remained free. F. Herbert Haessler.

Wright, R. E., and Nayar, K. K. Pigmented deposits in the lens and cornea of doubtful nature. *Brit. Jour. Ophth.*, 1936, v. 20, May, p. 295. (See Section 6, Cornea and sclera.)

10

RETINA AND VITREOUS

Adroque, E., and Malbran, J. Exudative retinitis and retinal cysts. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, March, p. 83.

On the basis of a review of the literature and of a case followed for fourteen years in which an exudative retinitis in one eye evolved into retinal cysts, the authors arrive at the conclusion that the two diseases are stages of the same polymorphous entity and that while in exudative retinitis the vascular changes noted, if any, are secondary, in angiomatosis they are primary; and that therefore there is no relation between the two. Pigmented lesions in the periphery of exudative retinitis have been noted often enough to constitute part of the disease entity. The etiology is either lues or tuberculosis. The case reported was due to lues. The cysts are cicatricial in origin. (Fundus photographs.) M. Davidson.

Avizonis, P. Results of diathermic coagulation of retinal detachment in the clinic at Kaunas. *Awerbach jubilee volume*, 1935, p. 28.

Brief clinical reports of 43 electrocoagulations on 25 patients with retinal detachment, with sixty percent satisfactory results. The chief merit of this procedure lies in the fact that accurate localization of the retinal tear is unnecessary. The author attributes failures to inability to gage the dosage accurately, which results in excessive or insufficient coagulation in some cases. (Visual fields.) Ray K. Daily.

Casanovas, J. Cystic degenerations and cysts of the retina. *Arch. de Oft. Hisp.-Amer.*, 1936, v. 36, May, pp. 239-272.

This article does not lend itself very well to abstract. The author discusses at length cystic degeneration found in the retina at the equator (cystic degeneration of Iwanoff), cystic degeneration of the macula, and cystic degeneration accompanying other retinal conditions such as albuminuric diabetic retinitis, retinitis circinata, Coats's and Hippel's disease, glioma of the retina, sarcoma of the choroid, and detachment of the retina. He reports some of the clinical findings, with microscopic studies. Cysts of the retina are also briefly discussed. In regard to cystic degeneration at the equator, the author does not believe that it is a result of senility, because he has been able to find it in young patients. Some other cystic degenerations are due to edema from circulatory disturbances and the formation of cavities which, if fused together, may reach the size of a larger cyst. (Bibliography, 9 photomicrographs.)

R. Castroviejo.

Charlin, Carlos. The pathogenesis of albuminuric retinitis. *Ann. d'Ocul.*, 1936, v. 173, April, pp. 285-292.

A series of cases of albuminuric retinitis showed marked improvement or total disappearance of the retinitis when placed on a strict low protein diet. On this regimen there was also loss of headache and nausea and gain in weight. But in spite of the clinical improvement marked hypertension, sclerosis of the retinal vessels, and laboratory evidence of renal insufficiency remained or increased. Some of the patients that had been cured of severe retinitis by the low protein diet died later in coma without return of the retinitis. In some cases there was neither retinal nor general improvement when the protein intake was restricted. Charlin considers that albuminuric retinitis is the result of general intoxication by an abnormal intermediate product of protein metabolism.

John C. Long.

Cechik-Kunina, E. A. A rare case of remains of the embryonal vascular system. *Awerbach jubilee volume*, 1935, p. 571.

A review of the literature and a report of a case of an unusual formation in the right eye of a myopic boy. A bluish-white membrane holding red blood vessels stretches forward from the nasal portion of the disc into the vitreous. There it spreads into a thin branching veil extending forward and externally. The upper outer branch of the central vein makes a forward curve passing through the veil in its course. The author considers this a congenital anomaly having no relation to the myopia. (Illustrations.) Ray K. Daily.

Cooke, C. T. A new electrode for surgical diathermy of the retina. *Arch. of Ophth.*, 1936, v. 15, April, pp. 711-712.

The electrode consists of a curved iridioplatinum pin 0.3 mm. in diameter, and varying in length from 1 to 2.5 mm.

J. Hewitt Judd.

Damel, C. S. Anatomy of the orbital and neural parts of the central artery and vein of the retina. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, March, p. 57.

Damel's histologic sections show that the central vessels in their passage through the dural perforation are not intimately adherent to it but are surrounded by more or less distinct fissures. But Damel does not share Behr's notion of their function as channels for drainage of the intervaginal cerebrospinal fluid. The intervaginal vessel sheath is from arachnoid and in its neural course the vessels gain sheaths from pia and glia. Sometimes the artery and vein run in separate compartments. There are connective tissue foramina in the lamina cribrosa for passage of the central vessels and their branches. While the artery is terminal and no anastomoses with the vascular plexus of Zinn have been encountered, the central vein does receive tributaries from the choroidal, scleral, and neural veins, just as the ophthalmic vein receives anastomoses from the facial, temporal, and lacrimal veins. (Photomicrographs.)

M. Davidson.

Damel, C. S. Anatomy of retinal vessels. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, April, p. 153.

In a complete review of the histology of the retinal circulation, Damel points out that the branches run sometimes deeply in the retina, displacing and invading even the external plexiform layer when of large size, quite apart from the presence of the terminal plexus in the internal granular layer. The division of the central artery into its two branches occurs on the disc in 71 percent of cases studied. The arteries are most frequently in front of the vein and the most frequent arteriovenous crossings are in the superior temporal vessels. The perivascular spaces are regarded as tissue spaces in communication with the cerebrospinal fluid but not true lymphatic channels. Photomicrographs.

M. Davidson.

Diaz Dominguez, Diego. Gonin's operation for retinal detachment. *Arch. de Oft. Hisp.-Amer.*, 1936, v. 36, May, pp. 225-239.

Report of seventeen cases of retinal detachment operated upon following Gonin's technique of thermocautery.

R. Castroviejo.

Edgerton, A. E. Circinate retinitis. *Amer. Jour. Ophth.*, 1936, v. 19, June, pp. 463-469.

Fralick, F. B., and Peet, M. M. Hypertensive fundus oculi after resection of the splanchnic sympathetic nerves. *Arch. of Ophth.*, 1936, v. 15, May, pp. 840-846.

The authors report a series of ninety patients with essential hypertension who were subjected to bilateral resection of the splanchnic nerves. In 36 cases the results have been checked several months postoperatively. Five patients were symptom-free with normal blood pressure. Resolution of the fundus changes of malignant hypertension took place in two and of an angiospastic retinitis in one. The fundus changes in the two remaining cases could not be followed. Eighteen patients showed an appreciable drop in blood pressure with general symptomatic improvement, but in only three of these were there signs of improvement in the fundi. Thirteen patients in whom no lowering of blood pressure was obtained showed no im-

provement in appearance of the fundus. The presence of marked changes in the fundus has not been found to be a contraindication to operation, as three patients who showed the most severe hypertensive neuroretinitis with severe organic vascular changes made the best response to operation.

J. Hewitt Judd.

Gesell, A., and Blake, E. M. Twinning and ocular pathology, with a report of bilateral macular coloboma in monozygotic twins. *Arch. of Ophth.*, 1936, v. 15, June, pp. 1050-1071.

The remarkable duplication of bilateral macular coloboma in twin girls aged twelve years is reported in detail, with drawings of the fundi of the four eyes. The physiology of twinning with its relationship to ocular conditions is discussed and the literature on ocular correspondence in twins is summarized. The hereditary aspects of coloboma and the genesis of atypical coloboma in twins are reviewed. (Bibliography.)

J. Hewitt Judd.

Guist, G., and Seidel, F. Concerning the treatment of retinitis pigmentosa. *Med. Klinik*, 1936, v. 32, March 13, pp. 350-352.

Retinitis pigmentosa is considered by the authors an endocrine disturbance with faulty mineral salt metabolism (chloride retention), and insufficient utilization of oxygen (shallow respiration, lowered metabolism). The treatment suggested consists in doses of an individually prepared hormone mixture and pure oxygen, and, in those cases in which there is much retention of chlorides, doses of renal lipoids. The result of persistent treatment is considerable and permanent enlargement of the visual field.

Bertha Klien.

Jancke, G. "Congestive retina" and "cyanosis retinae" in diseases of the blood and circulation. *Klin. M. f. Augen.*, 1936, v. 96, May, p. 605.

A woman of 36 years, affected with emphysema, relative cardiac insufficiency, and dyspnea, complained of headaches and severe visual impairment. The intense retinal edema and hemorrhages, with engorgement of the retinal

veins, subsided within three months, with normal vision. For this clinical picture the author proposes the term "congestive retina." It differs from cyanosis retinae in primary polycythemia, which shows dark bluish discoloration of the retinal vessels and fundus and later secondary dilatation and tortuosity of the veins. (Illustrations.)

C. Zimmermann.

Keller, J. M. Retinal periphlebitis in septic endophthalmitis and its ophthalmoscopic picture. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 520-533.

Keller discusses the anatomic and histologic aspects and describes the lesions of retinal periphlebitis found in chronic diseases of the uveal tract. A case is reported of a perforating scleral wound which progressed favorably until the eleventh day, when the eye became painful and red with the vitreous cloudy. Improvement followed milk injections, and about three weeks later ophthalmoscopic examination revealed several small white round spots along the course of the veins, especially in the nasal retina. They increased in number during the next week. Four days later they had disappeared entirely. This demonstrates that in endophthalmitis septica a retinal periphlebitis may occur as a separate disease independent of general participation of the retina in the inflammation. C. Allen Dickey.

Kiewe, P., and Reh, J. Hole-like affection of the macula. *Klin. M. f. Augenh.*, 1936, v. 96, April, p. 448.

A woman of 37 years presented a slight retinopapillitis of the right eye and a holelike change of the macula with moderate impairment of vision. After removal of a diseased right first upper molar tooth the retinopapillitis subsided with improvement of sight. The macular affection remained over nine months, finally showing a circumscribed lesion of the pigment epithelium. Ophthalmoscopic examination in red-free light excluded the formation of a hole, and accelerated settling time of the red blood corpuscles indicated the presence of a septic focus. (Colored plate.)

C. Zimmermann.

Kraupa, Ernst. Retinal tears. *Zeit. f. Augenh.*, 1936, v. 89, May, p. 136.

Deutschmann's assertion that no one had previously observed the development of retinal detachment from its inception in a tear was not true. Kraupa had reported such an observation in 1923. He now adds a further observation. A student came, after a night of dancing, with a retinal detachment and a small hole in the retina. Operation was refused. One year later the retina had become reattached and the hole persisted. Later another detachment occurred. Anyone who had missed the hole on first examination might assume that it occurred as a result of the last detachment. In a third patient, a retinal hole was clearly seen to result from traction of a strand of blood clot following retinal hemorrhage in hypertension.

F. Herbert Haessler.

Krause, A. C. The chemistry of the retina. 2. Chemical constitution. *Amer. Jour. Ophth.*, 1936, v. 19, July, pp. 555-557.

Lindner, K. Clinical study of the vitreous. I. Contraction of the vitreous. *Graefe's Arch.*, 1936, v. 135, p. 332.

To the contraction of the vitreous almost always present when a vitreous mass is elevated from posteriorly, the author has clinically observed its increased constriction after occurrence of the retinal tear, as well as the subsequent partial liquefaction of this raised vitreous. Using young rabbits not over four months old, electrocoagulation of the sclera in the region of the equator is performed over an area 3 to 4 mm. in diameter. A trephine of 1.5 to 2.5 mm. cross section is then used to penetrate this coagulated part of the sclera and the underlying choroid and retina. The trephined flaps are removed and a conjunctival suture inserted. Within three hours the anterior chamber begins to deepen. The latter continues until the chamber becomes very deep with the iris presenting a definite step or the shape of a funnel posteriorly. Other experiments are described. The author concludes that the content of albumen in the aqueous or perhaps related

changes in the aqueous play the principal rôle in contraction of the vitreous.

In a human eye with glaucoma, stony-hard and the anterior chamber almost absent, it was possible to produce acute and prolonged hypotony by application of a vitreous fistula and simultaneous irritation of the iris by subconjunctival injection of 0.2 c.c. of a ten percent sodium chloride solution. The acute hypotony produced by acute contraction of the vitreous is probably due to a suddenly increased percolation of the aqueous through the mass of the vitreous.

H. D. Lamb.

Maniukova, H. K. Lysate therapy in retinitis pigmentosa. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 3, p. 348.

The rationale of this therapy is based on the fact that lysates stimulate cell metabolism, and their use in retinitis pigmentosa is an attempt to stimulate the biologic processes of dying cells. Forty-three patients were treated with injections of tissue extracts of retina, liver, pituitary, adrenal, cortex, and corpus luteum. In 58 percent of the cases there was a temporary improvement manifesting itself in increased adaptation, improved visual acuity, and extended fields.

Ray K. Daily.

Markus I. M., and Youdkevich, D. B. Morphologic and biochemical studies of the blood in lysate therapy of retinitis pigmentosa. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 3, p. 388.

Detailed study of the morphology of the blood in twelve cases of retinitis pigmentosa shows chloranemia, which suggests an endocrine disturbance. Changes in nitrogen, cholesterol, and bilirubin content indicate pathology in the liver. Changes in the potassium and calcium ratio point to involvement of the vegetative nervous system. Lysate therapy normalizes the morphology of the blood, and its nitrogen and cholesterol content, but it does not influence the bilirubin and mineral content, which shows that lysates do not affect the status of the vegetative nervous system.

Ray K. Daily.

Merkulov, I., and Kopit, P. Lysate therapy in retinitis pigmentosa. *Soviet-*

skii Viestnik Opht., 1936, v. 8, pt. 3, p. 369.

A detailed report of thirteen cases treated with ocular and liver lysates. The tables show definite functional improvement as measured by adaptation, visual acuity, and visual fields. The fundus pictures remained unchanged. (Visual fields.)

Ray K. Daily.

Morax, V. Medical comments on retinal detachment. Averbach jubilee volume, 1935, p. 312.

The fact that seventeen percent of cases of retinal detachment are bilateral demonstrates the necessity for prophylactic measures to save the uninvolved eye. The histories of his private patients convinced Morax that retinal detachment had a luetic basis. The fact that antiluetic therapy has no effect on retinal detachment is to the author no argument against the luetic etiology, for in parenchymatous keratitis antiluetic treatment is also ineffectual. Nor are negative serologic reactions conclusive. He therefore insists on four to five years of intensive antiluetic therapy for cases of retinal detachment, and in those cases which submitted to this treatment the other eye remained uninvolved.

Ray K. Daily.

Nagy, M., and Incze, K. The relation of hypovitaminosis to dark adaptation. *Arch. f. Augenh.*, 1936, v. 109, May, p. 567.

The vitamin contents of the meals of children from three different schools were carefully measured. Though they were found to vary from 1,000 units in one school to 246 in another and 162 in a third school, the dark adaptation ability of the children of all three schools was about the same. A great difference, however, was encountered between spring and autumn values. A change for the worse occurred in the spring equally in all three schools. The authors believe that the effect of the vitamin-rich food of the children living in the center of the city was counteracted by the anemia of the children due to city habitation, while the effect of the vitamin-poor food of the children living in the

outskirts was compensated by their increased exposure to sunlight and air.

R. Grunfeld.

Orr, H. C., and Young, J. H. **Acetylcholine in embolism of the retinal artery.** *Brit. Med. Jour.*, 1935, June 1, p. 1119.

A case of embolism is reported in which subconjunctival injections of acetylcholine resulted in improvement of vision from 6/18 to 6/4 and complete restoration of the visual field.

Edna M. Reynolds.

Reese, A. B. **Massive retinal fibrosis in children.** *Amer. Jour. Ophth.*, 1936, v. 19, July, pp. 576-582; also *Trans. Amer. Acad. of Ophth. and Otolaryng.*, 1935, 40th annual meeting, p. 145.

Rosenblum, M. E. **Retinal detachment with separation at the ora serrata.** *Awerbach jubilee volume*, 1935, p. 388.

A review of the literature and an analysis of the author's own cases. Of 131 cases of retinal detachment ten percent were with separation at the ora serrata. They may be traumatic as well as idiopathic, and are found usually in nonmyopes under 35 years of age. The separation is as a rule in the lower portion of the fundus, and only in traumatic cases is separation seen above. The author treats them by electrocoagulation as used by Weve and Safar.

Ray K. Daily.

Sobański, J. **Circulation of blood in the retina under physiologic conditions.** *Graefe's Arch.*, 1936, v. 135, p. 372.

Eighty persons varying in age between 7 and 73 years with normal vascular conditions were investigated regarding the venous and arterial pressure in the retina and the general vascular tension. The retinal venous tension varied on an average between a minimum of less than the intraocular tension (16 to 22 mm. Hg) and a maximum of 28 mm. Hg for normal subjects of 7 to 15 years old, and a minimum of 23 mm. Hg and a maximum of 36 mm. Hg for normal individuals over 40 years of age. The retinal arterial tension in subjects between 7 and 15 years averaged

68/40 mm. Hg; over 15 and up to 75 years it averaged 56/48 mm. Hg, with a maximum of 90/80 mm. Hg. The relation of the minimal venous to the minimal arterial pressure varied between 1 to 1.9 and 1 to 3. The relation of retinal arterial tension to general blood-pressure varied between 1 to 1.3 and 1 to 1.6.

H. D. Lamb.

Storcheim, F., and Taube, E. L. **Fundus findings in tuberous sclerosis.** *Amer. Jour. Ophth.*, 1936, v. 19, June, pp. 508-509.

Sugita, Yozo. **Colloidal chemical observations on the fine structure of the retina and the color of the fundus.** *Graefe's Arch.*, 1936, v. 135, p. 187.

When the retinal layers in the eyes of men, rats, and frogs are stained with substantive coloring matters and particularly oxamin-blue, the cellular micellae and the micellar interspaces are found to be smallest in the rod-cone layer and greatest in the cell nuclei of the outer and inner nuclear layers and in the nuclei of the ganglion and pigment-epithelium cells. The very small micellae in the cones of the macula would explain the yellow color of that region in comparison to the red color of the remainder of the fundus, according to Ostwald's theory (Ostwald, W., *Handbuch der Kolloidwissenschaft*, v. 1: *Licht und Farbe in Kolloiden*, part 1). That author established the fact that according to the size of the colloidal particles their natural color varied. From largest to smallest, it was as follows: green, blue, violet, red, orange, yellow.

H. D. Lamb.

Szily, A., and Machemer, H. **Further contributions to the electrolytic treatment of retinal detachment.** *Klin. M. f. Augenh.*, 1936, v. 96, Feb., p. 191.

In employing the usual unipolar electrolysis the authors observed undesirable effects on parts distant from the field of operation. Hence they substituted bipolar electrolysis. The essential of this modification is to limit the action of the current in the eye by closely approximating the two poles to each other, so that the electric current can

penetrate only a small section of the eye. They found this decidedly local stimulation in surface and perforation electrolyses to be the most effectual and least harmful procedure. Up to May, 1935, 31 cases were treated in this way (40 operations in all). Of these, 18 healed with total reattachment and good vision, 4 were improved, and 9 almost hopeless cases showed no results. (Illustrations.) C. Zimmermann.

Uyama, Yasuo. Experimental tuberculous periphlebitis retinae with particular reference to the state of immunity in the animal experimented upon. Graefe's Arch., 1936, v. 135, p. 364.

Rabbits were injected subcutaneously with dilutions of old tuberculin in seven animals, "tuberculococcigen" in nine, and fat-free vaccine in ten animals. A small quantity of an emulsion of living tubercle bacilli was injected into the left ventricle of these prepared rabbits as well as into fourteen control animals not previously treated with antigen. After an interval of seventy to ninety days, the eyes of all the rabbits were studied ophthalmoscopically and anatomically. In four eyes from four animals previously injected with antigen, a periphlebitis of the retina was discovered by microscopic examination of these fifty-two enucleated eyeballs. Only in one eye among the fourteen control animals was a periphlebitis retinae discovered anatomically. In all five affected eyes, the cells infiltrating the retinal veins were lymphocytes and epithelioid cells. H. D. Lamb.

Vercelli, Giuseppe. Sudden and definitive blindness in a patient affected by old cranial trauma, hydrocephalus, and primary atrophy of the disc. Riv. Oto-Neuro-Oft., 1935, v. 12, Nov.-Dec., pp. 711-720.

A man of 39 years who during the World War had sustained a wound of the left parietal region and had been recently affected by attacks of hemiparesis, dizziness, and bilateral amaurosis, became suddenly blind and unconscious. His examination showed right optic atrophy, filiform retinal arteries and partial atrophy in the left eye, and

symptoms of hydrocephalus. The writer assumes that the syndrome was due to a persistent attack of spasm of the central arteries of both retinas arising from intracranial hypertension secondary to the old trauma. (Bibliography, 2 figures.) M. Lombardo.

Visser-Heerema, J. The specific weight of the fluid gained at retinal detachment operations. Arch. f. Augenh., 1936, v. 109, May, p. 543.

The author found regularly an increase in the specific weight of the subretinal fluid according to the age of the detachment. The fluid was collected by a capillary U tube at the operations. Detachments which took their origin in the upper half but sank quickly had a subretinal fluid of higher specific gravity than those detachments which became baggy. The specific gravity of the vitreous does not differ much from that of the subretinal fluid so that the sinking of the detachment cannot be explained purely by gravitation.

R. Grunfeld.

Walker, Clifford. Pupil goggles. Electrodes for diathermic heat. Galvanic unit. Trans. Amer. Ophth. Soc., 1935, v. 33, p. 404.

The author exhibited a pair of aluminum pupil-goggles in a standard frame, two forms of electrode for applying diathermic heat to the eye, and a galvanic unit with a three-way switch which enables the operator to use galvanic or diathermic treatment with the same scleral electrode.

C. Allen Dickey.

Walker, C. B. Special device for localization and treatment of retinal tear with galvanic current. Arch. of Ophth., 1936, v. 15, June, pp. 1094-1097.

The instrument pictured and described permits the passage of a 25 percent iridium-platinum micro-needle with a diameter of $3/1000$ inch through a 25-gage stainless steel or platinum cannula attached to a 2-c.c. hypodermic syringe, fitted with a piston chuck to hold the needle and a guide bar which can be adjusted to allow any depth of penetration desired. The tip of the can-

nula has two sharp spurs to prevent slipping. The use of the instrument is discussed.
J. Hewitt Judd.

Walker, C. B. Surgical treatment of separated retina by the galvanic method. *Amer. Jour. Ophth.*, 1936, v. 19, July, pp. 558-570; also *Trans. Amer. Ophth. Soc.*, 1935, v. 33, p. 48.

Weve, H. Retinal detachment caused by foveal hole cured by diathermy. *Arch. f. Augenh.* 1936, v. 109, May, p. 534.

Three cases described were treated with a special perforation electrode simultaneously serving as a light source. The external rectus muscle and also the superior or inferior rectus muscle, as the case might be, were severed, and the eyeball turned and luxated to reach the fovea. The author emphasizes the necessity of localizing the tear accurately, since a delimiting operation in the macular region would be followed by great damage to vision. The results regarding restoration of vision were not particularly good, but good visual fields were obtained.
R. Grunfeld.

Würdemann, H. V. The formation of a hole in the macula. *Amer. Jour. Ophth.*, 1936, v. 19, June, pp. 457-463.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Charlin, C. C. Acute bilateral retrobulbar optic neuritis. *Arch. de Oft. Hisp.-Amer.* 1936, v. 36, Feb., pp. 77-90.

The author reports fourteen cases of acute bilateral retrobulbar optic neuritis. The symptoms found in this type of case may be a complication of general infection (grippe) which brings about marked congestion of the paranasal region. This condition would strangle the optic nerves in the optic canals and produce a hyperemia of the meninges which would explain the severe headache. The sudden improvement of vision obtained by operating on the sinus may be explained by freeing of the optic nerves in the optic canals.
R. Castroviejo.

Frost, A. D. Papilledema with special reference to papilledema associated with sinus disease. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 480-507.

The author classifies papilledema and discusses the fundus findings, subjective symptoms, field changes, and pathology of this condition. Two cases are reported in which there were enlarged blind spots and central scotomata with marked reduction of vision. Improvement followed nasal packs and, after aëration of the posterior sinuses was effected surgically, the vision returned to normal. The author offers as an explanation either mechanical pressure or true inflammatory involvement. If the stasis is permitted to exist for some time a mild inflammatory or toxic effect may be produced by the edema itself, thus causing a true axial neuritis.
C. Allen Dickey.

Gasteiger, H. The value of roentgen diagnosis in doubtful affections of the optic nerve. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 589.

By six cases Gasteiger shows the diagnostic value of antero-posterior, bitemporal, and stereoscopic X-ray pictures of the skull. The pictures revealed calcification and arteriosclerosis of vessels (especially the internal carotid), which by pressure on the nerve or trophic disturbance produced visual impairment. Such changes explain atrophic excavation in pseudoglaucoma (without hypertension) and in cases of retrobulbar neuritis without ophthalmoscopic alterations. (Illustrations.)
C. Zimmermann.

Hesse, Erich. The therapy of methyl-alcohol amblyopia. *Zeit. f. Augenh.*, 1936, v. 89, April, p. 51.

After three days of fasting a man drank 100 c.c. of methyl alcohol diluted with an equal volume of water. Seven to ten c.c. is considered necessary to produce blindness and 30 c.c. the lethal dose. The patient's visual disturbance was so severe that he had to be led. He was seen in the eye clinic six days after the suicidal attempt and was treated with four lumbar punctures with extensive withdrawal of fluid on four occa-

sions in the ensuing ten days. When last examined eight months later, his visual acuity was 0.9 and 0.8 in right and left eyes respectively. In the right eye, colors were recognized with central fixation, though in a small nasal area red was called yellow. The left eye has a large absolute scotoma contiguous to the blind spot.

F. Herbert Haessler.

Igersheimer, Joseph. Pathogenesis and therapy of tabetic optic atrophy. Averbach jubilee volume, 1935, p. 151.

A comprehensive review of the literature and a brief reference to the author's work, which demonstrated spirochete-containing foci in the pia, arachnoid, and the neuroglia of the optic nerves but never in the nerve tissue. The author is convinced that the disease begins at the borders of the nerve and enters from the perineural spaces. He believes that the orbital or the intracranial portion of the nerve may be the primary seat of the disease. After discussing the various therapeutic procedures he concludes that the therapy of optic atrophy is still in the research stage.

Ray K. Daily.

Lokshina, S. I. Tobacco toxicosis. *Sovetskii Viestnik Opt.*, 1936, v. 8, pt. 3, p. 464.

The writer discusses the rôle of methyl alcohol, present in tobacco leaves and in prepared tobacco, in tobacco amblyopia.

Ray K. Daily.

Michail, D., and Benetato, G. Researches on the respiration of the optic nerve. *Arch. d'Opt.*, 1936, v. 53, May, p. 346.

The oxygen consumption of human optic nerves was investigated by the manometric method of Warburg. These researches show that the therapeutic practice which results from the theoretic conception that the optic atrophy of tabes is due to a diminution of respiratory exchanges of the optic nerve is completely false. (Bibliography.)

Derrick Vail.

Much, Viktor. Amyl nitrite in the treatment of diseases of the optic nerve. *Zeit. f. Augenh.*, 1936, v. 89, April, p. 58.

The author treated eight cases of optic neuropathy with amyl-nitrite inhalations. In five cases the disease was retrobulbar, in all probability a toxic amblyopia due to alcohol or tobacco; at least no other probable etiologic factor could be found. In every case there was distinct improvement, in six cases complete cure. The vasodilatation produced by the amyl-nitrite causes hyperemia of the choroid and retina, and therefore improves the metabolism of the tissues.

F. Herbert Haessler.

Ochapovskii, S. V., Menshutin, M. A., and Sharkovskii, I. S. Data of the Kuban Eye Clinic for twenty years relative to pathology of the optic nerve. Averbach jubilee volume, 1935, p. 320.

Etiologic and pathologic classifications of 1,738 cases of diseases of the optic nerve. The tables demonstrate the bizarre etiology of the disease, and the fact that various pathologic processes may be caused by the same etiologic factor.

Ray K. Daily.

Paton, Leslie. Papilledema and optic neuritis. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1935, 86th annual session, p. 98. (See *Amer. Jour. Ophth.*, 1936, v. 19, July p. 622.

Serr, H. Choked disc in its general clinical and ophthalmologic significance. *Graefe's Arch.*, 1936, v. 135, p. 431.

The author discusses choked disc regarding its pathogenesis, differential diagnosis from optic neuritis and pseudoneuritis, its occurrence following injuries to the skull, and the great importance of referring cases with this condition to the brain surgeon very early.

H. D. Lamb.

Sobański, J. The production of tabetic optic atrophy and its treatment. *Graefe's Arch.*, 1936, v. 135, p. 401.

Tabetic optic atrophy occurs when the diastolic pressure in the central retinal artery is less than twice the intraocular tension. In a table are listed 33 cases of tabetic optic atrophy in which the diastolic pressure in the central artery of the retina so nearly approached

the ocular tension that the latter was actually higher than the diastolic blood pressure in the retinal capillaries. Of the 33 patients, 20 had lost all vision in one eye. As well as antiluetic treatment and tonics, all the cases received miotics. In 24 eyes cyclodialysis was performed and in one eye cyclodialysis and iridencleisis. Improvement was noted in 36 eyes out of 46 which had some vision when this treatment was begun. In five eyes the vision remained unchanged and in five it grew worse.
H. D. Lamb.

Soriano, S., and Malbran, J. Toxic amblyopias from hair-dyes (lead compounds). *Arch. de Oft. de Buenos Aires*, 1936, v. 11, April, p. 222.

Toxic amblyopia should be a term reserved for cases without inflammatory etiology and retrobulbar neuritis for those with it. One case is reported in a man who had used an acetate of lead dye for several years. Discontinuation of the dye led to slight improvement only after several months' observation. The other case was of a woman with bilateral central scotomata and postneuritic optic atrophy in whom radiograms of the head showed extremely opaque hair but so far instead of lead only silver was demonstrated in the dye at present used. Probably a lead compound had been used before.

M. Davidson.

Sorsby, Arnold. Ocular lesions in bony dystrophies. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 499.

The author favors and reproduces Waardenburg's classification of cranial deformities. Oxycephaly appears in three other clinical varieties, acrocephalo-syndactyly (Apert) cranio-facial dysostosis (Crouzon) and hypertelorism (Greig). Ocular lesions in association with digital abnormalities are classified as (1) arachnodactyly (2) syndactyly with aniridia (3) polydactyly with retinitis pigmentosa (4) Lawrence-Moon-Biedl syndrome (5) brachydactyly and microcornea (6) lobster-hand and aniridia (7) apical dystrophy of hands and feet and macular coloboma.
Beulah Cushman.

Wolff, Eugene. The causation of amblyopia following gastric and other hemorrhages. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 342.

The author associates amblyopia following such hemorrhages with vascular spasms similar to those of quinine amblyopia. Quinine inhibits the oxidizing power of protoplasm and diminishes the oxidizing power of the blood. Similarly the hemoglobin content of the blood is reduced by the repeated hemorrhages, and the amblyopia may correspond to a time when the hemoglobin content and oxygen supply to the tissues are reduced and spasm of the vessels develops. The histopathologic findings in eyes with amblyopia following hemorrhages tend to show that the essential lesions are in the retina. This does not conflict with the suggestions as to vascular spasm.

Beulah Cushman.

12

VISUAL TRACTS AND CENTERS

Aubineau. Subjective ocular disturbances following cranial trauma. *Ann. d'Ocul.* 1936, v. 173, March, pp. 205-207.

After head injuries with loss of consciousness, subjective visual disturbances without demonstrable injury may be visual or asthenopic. On physical exertion or on changing the position of the head there may be giddiness and a sensation of displacement of objects. This sensation lasts for a short time and then abruptly ceases. The asthenopic symptoms are independent of refractive errors, accommodation, or muscular imbalance. Fixation on an object causes exhaustion and sometimes slight ptosis. These symptoms are part of a commotional syndrome and may be due to microscopic brain lesions, corticomeningeal adhesions, vasomotor disturbances, alterations of the cerebrospinal fluid, or other causes.

John C. Long.

Farberow, B. J. Roentgenogram of the head in neurofibromatosis of Recklinghausen. *Zeit. f. Augenh.*, 1936, v. 89, April, p. 81.

In three patients the most frequent changes were deformities of the facial

bones. Extensive hyperplasia is rare. Enlargement of the sella occurs most frequently when there are tumor masses in the orbit. Then the optic canals are usually enlarged and defects in the orbital walls are not uncommon. Roentgenograms give no evidence that the hypophysis is involved in the development of neurofibromatosis. Systematic collection of more extensive material is advisable.

F. Herbert Haessler.

Johnson, T. H. Homonymous hemianopia, practical points in interpretation, with report of 49 cases in which the lesion in the brain was verified. *Arch. of Ophth.*, 1936, v. 15, April, pp. 604-616.

Johnson analyzes the findings in 49 cases of hemianopia associated with verified brain tumor. He concludes that homonymous field defects, either complete or sectoral, indicate a lesion in the visual system posterior to the chiasm but do not locate the lesion in any specific area. In temporal lobe lesions the majority of the hemianopic defects are incomplete, crescentic defects being seen as frequently as quadriseptal defects. In lesions of the occipital lobe a complete hemianopia is much more likely, while hemianopia tends to be complete when found in frontal lesions.

J. Hewitt Judd.

Newton, F. H. Paracentral homonymous hemianopic scotoma. *Amer. Jour. Ophth.*, 1936, v. 19, July, pp. 600-601.

Renedo, M. Psychoneurosis of terror, amaurosis. *Arch. de Oft. Hisp-Amer.*, 1936, v. 36, March, pp. 139-143. (See *Amer. Jour. Ophth.*, 1936, v. 19, May, p. 443.)

Scala, N. P., and Spiegel, E. A. The pupillary reactions in combined lesions of the posterior commissure and of the pupillodilator tracts. *Trans. Sec. on Ophth.*, *Amer. Med. Assoc.*, 1935, 86th annual session, p. 184. (See *Amer. Jour. Ophth.*, 1936, v. 19, July, p. 625.)

Tichomirov, P. E. Ophthalmoplegic migraine. *Awerbach jubilee volume*, 1935, p. 481.

A brief review of the theories relative to the etiology of the disease and a report of a case of migraine in which the attacks of severe headache were followed by paralysis of the right extensor, lasting from three days to three months. These attacks occurred several times yearly. The author attributes the disease to a spasm of the posterior cerebral arteries causing edema of the nerve root or nucleus at the bottom of the fourth ventricle, or to a recurrent hemorrhage in the same area.

Ray K. Daily.

Worms, G. Oculohypophyseal syndrome consecutive to a suppurative sphenoidal sinusitis. *Arch. d'Ophth.*, 1936, v. 53, March, p. 207.

The author reports the case of a pupil officer aged 21 years who had bilateral central scotoma beginning gradually and progressing after a few remissions to practical blindness (1/100) in each eye within a period of five to six weeks. The fields were concentrically contracted, and the pupils were dilated and almost paralyzed. The optic discs were somewhat edematous, the veins dilated, the arteries narrowed. The patient's appearance was decidedly of the adiposo-genital type. Roentgenograms revealed marked enlargement of the sella turcica with partial destruction of the posterior clinoid processes. No attention was paid to the sinuses, and a diagnosis of pituitary tumor was made. Operation not being permitted, radiotherapy was used, after which the headaches decreased, but vision did not improve. The patient became entirely blind with complete secondary atrophy two months later. Six years later he died of meningitis. Autopsy revealed a network of filamentary adhesions fixing the optic nerves and chiasm to the base of the brain, an enlarged congested hypophysis bathed in pus, and a well developed basal meningitis. On elevating the hypophysis a perforation of the posterior superior portion of the sphenoidal sinus was found. Both sphenoids were filled with polyps and pus. Histologic examination of the hypophysis did not reveal any adenoma, but showed chronic inflammatory reaction. The

author argues that the sinus infection was alone responsible for the inflammatory hypertrophy of the hypophysis and the bilateral optic neuritis. (References, illustrations.) Derrick Vail.

13

EYEBALL AND ORBIT

Baltin, M. M. Hyperostosis of the orbit. Awerbach jubilee volume, 1935, p. 53.

In three cases exophthalmos and optic atrophy were caused by hyperostosis of the large and small wings of the sphenoid with narrowing of the optic canal. The patients were middle-aged women with a history of cranial traumatism. The author considers the process a manifestation of a pituitary disturbance initiated by the traumatism. Complete surgical removal is scarcely possible, and incomplete removal may stimulate the growth of the neoplasm. Treatment therefore is narrowed to deep X-ray therapy and the prognosis is unfavorable. (Roentgenographs.)

Ray K. Daily.

Birch-Hirschfeld. Clinical course and therapy of orbital phlegmons. Awerbach jubilee volume, 1935, p. 84.

A report of a case of thrombophlebitis of the orbit with multiple purulent foci in the retrobulbar tissues. Exploration of the orbit through wide incisions at the inner upper and outer lower angles of the orbit evacuated but little pus, and had little influence on the exophthalmos and ocular motility. Suction applied to the wound daily evacuated a bloody pus and under this treatment the patient recovered, although the vision of the eye was lost from thrombosis of the central retinal vein. The author condemns exploratory puncture of the orbit because it may carry infection to uninvolved tissue, may wound important structures, and does not provide sufficient drainage. Incision through the orbital border and elevation of the periosteum permits a search for the origin of the phlegmon and provides better drainage.

Ray K. Daily.

Cohen, Martin. Inflammatory exophthalmos in catarrhal disorders of the

accessory sinuses. Arch. of Ophth., 1936, v. 15, March, pp. 457-476; also, Trans. Sec. on Ophth., Amer. Med. Assoc., 1935, 86th annual session, p. 209.

The author reports four cases. In the first there was a reverse infection starting as a furunculosis of the ala nasi and spreading to the orbit, accessory sinuses, and cavernous sinuses and resulting in death. The second was of nonsuppurative cellulitis due to subacute ethmoiditis, and subsided under local treatment to the eyes and nose. The third and fourth cases were of a chronic inflammatory nature and were relieved through a Krönlein operation. (Photographs, discussion.)

J. Hewitt Judd.

Feldman, A. I., and Wolfson, S. I. Orbital complications in acute infections of the superior maxilla and accessory nasal sinuses in children. Awerbach jubilee volume, 1935, p. 546.

At the otolaryngological department of the Second Moscow Eye Clinic, orbital complications in infants are found to be caused most frequently by osteomyelitis of the superior maxilla. As the sinuses develop, ethmoiditis following acute infectious diseases becomes a prominent etiologic factor. The author discusses in detail the surgical treatment of the nasal infections.

Ray K. Daily.

Fradkin, M. I., Rossel, S. I. and Antushevich, E. K. The effect of physico-chemical factors on the hemato-ophthalmic barrier. Awerbach jubilee volume, 1935, p. 556.

The objective of this experimental study on rabbits was to determine the effect of a change in the osmotic pressure of the blood on ocular permeability. The osmotic pressure, measured on the Berkman cryoscope, was raised by the injections of 10 c.c. of ten percent saline per kilogram of body weight. The indicators of permeability were Na_4FeCy_6 and trypan blue, which under normal conditions do not pass into the aqueous humor. In the author's experiments these substances permeated the aqueous humor after the osmotic pressure was raised. The author interprets

these findings as additional evidence of the presence of a complex hemato-ophthalmic barrier, functioning on a biologic basis and inactivated by the raised osmotic pressure.

Ray K. Daily.

Iribarren, L. A. A case of monolateral anophthalmos. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, April, p. 205.

In the case reported the palpebral fissure was only 8 mm. wide, no rudimentary globe was palpable, and no colobomatous cyst demonstrable. Occlusion of the fetal cleft is regarded as the mechanism. M. Davidson.

Kluever, H. C., and O'Brien, C. S. Panophthalmitis due to *Clostridium welchii*. *Arch. of Ophth.*, 1936, v. 15, June, pp. 1088-1093.

In a man aged 37 years, fulminating panophthalmitis with gas in the anterior chamber developed within a few hours after a penetrating injury of the eye. A clinical diagnosis of infection with gas bacilli was made and the eye was eviscerated. Polyvalent gas gangrene antitoxin was administered and the patient recovered. The organism was isolated in pure culture from the anterior chamber. The literature is reviewed. J. Hewitt Judd.

Kolen, A. A. Methods of plastic surgery of the orbit and the lids. Awerbach jubilee volume, 1935, p. 209.

A comprehensive and detailed discussion of the various phases of the subject. The conclusions are that plastic surgery has reached a development which justifies its wide application in the practice of all ophthalmologists. The material for grafts and the type of graft have to be decided for each individual case, and no one method can be used universally. Free cutaneous transplants should be of the same size as the defect and sutured with slight tension. The type of dressing is not so important as daily inspection at dressings. The author finds horse-hair the best suture material. Postoperative physiotherapy enhances the result considerably. Plastic restoration of the conjunctival sac has been replaced in large measure, in the writer's practice, by

forced stretching of the conjunctival sac, based on the elasticity of the conjunctiva. The author's method consists in forcibly introducing into the conjunctival sac the largest possible prosthesis and holding it there with lid sutures. In four to seven days the conjunctival sac is found sufficiently and permanently stretched and adapted in form to the sutured lids. In plastic restoration of the conjunctival sac, the author, instead of using plastic compound, lines the cavity with vaselin-saturated gauze which can be left in place for days and packs this gauzelined cavity with gauze which can be changed as indicated. (Illustrations.)

Ray K. Daily.

Kraupa, E., and Mendl, K. Intermittent exophthalmos. *Zeit. f. Augenh.*, 1936, v. 89, April, p. 40.

Intermittent exophthalmos has been recognized and reported only 95 times in the last 65 years. In Kraupa's 31-year-old patient the right eye had protruded upon stooping ever since the tenth year. With the occurrence of exophthalmos the lids would swell and the lid slit become narrowed. On the roentgenogram two phleboliths were shown which changed their position 0.5 cm. with protrusion of the eyeball. So few cases have come to operation that a clear classification on the basis of the anatomic cause is impossible. The protrusion depends on the state of filling of blood spaces such as varices and angiomas and may be combined with pulsation.

F. Herbert Haessler.

Krause, A. C. Biochemistry of the eye. *Arch. of Ophth.*, 1936, v. 15, March, pp. 522-543.

The author reviews the literature and presents observations for each anatomic division of the eye. (Bibliography of 178 articles.) J. Hewitt Judd.

Lamb, H. D. Cyclopia in a new-born kitten. *Arch. of Ophth.*, 1936, v. 15, June, pp. 998-1003.

The kitten, which lived several hours after birth, had a central single eyeball 9 by 11 by 11 mm. There was no oral cavity or nasal process. The cerebral

hemispheres were absent, and only the posterior part of the brain stem and the cerebellum were present. The histologic findings are described and are illustrated by photomicrographs. Chief among these were coloboma of the choroid and rosettes in the retina. There was no doubling or reduplication of any part, and this, together with the lack of development of brain and face, supports the theory of Huschke that the ocular anlagen of the two sides are normally fused together for a brief period before separating into the two retinal rudiments. J. Hewitt Judd.

Pokrovskii, A. I. Tumors of the orbit. Averbach jubilee volume, 1935, p. 337.

A discussion of the pathology, prognosis, and therapy of neurinoma, chondro-osteosarcoma, and encapsulated fibrosarcoma of the orbit, with detailed case reports of each type of tumor. Neurinomas are benign tumors but the damage done by their pressure in the orbit calls for immediate surgical removal. A chondrosarcoma originating from one of the right periorbital sinuses grew slowly for three years, and then within a few months assumed a malignant character with intoxication and exhaustion of the patient. During attempted exenteration of the orbit, excessive hemorrhage prevented complete extirpation of the growth and exact determination of the origin of the tumor. Such a clinical course demonstrates the necessity for early operation. The fibrosarcoma originated from the membranes of the optic nerve, and caused pressure atrophy of the nerve. The unusual feature of this case was the growth of the tumor forward, thinning the sclera, instead of backward into the orbit. In addition to surgical removal these tumors should have radiotherapy as a prophylactic measure against recurrence. (Illustration.)

Ray K. Daily.

Rosenstein, A. Microphthalmos and injury to the germ cell. *Wien. med. Woch.*, 1936, no. 9, Feb. 27, p. 238, and no. 10, March 7, p. 267.

In these two articles the author reviews the literature of the etiology of microphthalmos and presents three

cases to substantiate her view that injury to the germ cell is a factor to be considered. In all three cases the parents were alcohol imbibers to a marked degree.

Theodore M. Shapira.

Savelev, S. V. Vascular tumors of the orbit. Averbach jubilee volume, 1935, p. 406.

A detailed report of two cases of hemorrhagic cysts of the orbit. Both were of traumatic origin, produced progressive exophthalmos with corneal complications, and were successfully removed surgically. (Illustrations.)

Ray K. Daily.

Slonimski, S. L. Sanitary hygienic character of the manufacture of ocular prothesis. *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 3, p. 454.

A description of the various processes used in the manufacture of artificial eyes.

Ray K. Daily.

Weskamp, C., and Alvarez, C. Pure exophthalmos originating from Basedow's disease. *Ann. d'Ocul.*, 1936, v. 173, April, pp. 273-285.

In a series of cases the pulse rate and basal metabolic rate were normal and there was no evidence of goiter. There was, however, nervousness and slight tremor. Apparently these cases represent a fully developed form of Basedow's disease in which exophthalmos is the only definite symptom.

John C. Long.

14

EYELIDS AND LACRIMAL APPARATUS

Arruga, H. Dacryostomy. Averbach jubilee volume, 1935, p. 13.

A detailed description of an external dacryocystorhinostomy in which the osseous partition is removed with a motor-driven trephine and burrs. Of eight hundred operations 95 percent gave satisfactory results. (Illustrations.)

Ray K. Daily.

Baratta, Orazio. Dacryocystitis from malformations and traumatic bone deformities. *Riv. Oto-Neuro-Oft.*, 1935, v. 12, Nov.-Dec., pp. 753-781.

Among 150 patients affected by dacryocystitis one had positive Wassermann, one was affected by tuberculosis, and seven showed a hereditary factor. In 18.77 percent of the cases atrophic, hypertrophic, and ozenatous rhinitis was present, while by roentgenography 6 percent showed opacification of the ethmoidal cells, 9.3 percent opacification of the frontal, 27.3 percent opacification of the antrum, and 2.67 percent pansinusitis. Opacification of the antrum was found in cases of phlegmon of the sac which started with symptoms of peridacryocystitis. The writer gives the clinical history of dacryocystitis connected with morphologic changes of the nose and lip and of nasal cavities, or anomalous position of the tendon, lacrimal bone, nasal canal, septum, and turbinates. (Bibliography, 16 figures.)

M. Lombardo.

Basterra, J. Remarks about the extranasal dacryocystorhinostomy. *Arch. de Oct. Hisp-Amer.*, 1936, v. 36, April, pp. 208-216.

After a brief historical outline, the author makes some remarks about trephining with dental drills and suturing an anterior flap of the sac to a corresponding flap of the nasal mucosa. For both of these technical details he claims priority. He mentions X-ray of the lacrimal passages after injecting barium sulphate, lipiodol, or iodipin as a valuable diagnostic procedure.

R. Castroviejo.

Bokstein, F. S. Prevention and treatment of recurrences after Toti's operation. *Awérbach jubilee volume*, 1935, p. 91.

From 75 endonasal reoperations after Toti's operation the author is convinced that failures after Toti's operation are due to insufficient size of the nasal opening, its improper position, or inadequate postoperative intranasal treatment permitting formation of granulations in the opening. To avoid these errors the ophthalmologist should, in the author's opinion, have some knowledge of rhinoscopy and the anatomy of the outer nasal wall. For this purpose he recommends three months service in a

rhinologic clinic for those who intend to treat disease of the lacrimal canal.

Ray K. Daily.

Galewska, S., and Litauer, R. **Operative treatment of entropion and trichiasis by Maher's method.** *Rev. Internat. du Trachome*, 1936, v. 13, Jan., pp. 41-47.

The author used Maher's operation for repair of entropion and trichiasis 249 times between 1921 and 1931. It was successful in nearly all cases and the author feels it should be more generally utilized. The simple technique consists of placing a mucous membrane graft on the conjunctival surface of the lid after deep incision through the tarsus to allow straightening of the deformed lid. (4 illustrations.)

P. J. Leinfelder.

Grósz, Stephan. **Lupus erythematoses palpebrae.** *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 636.

A man of 42 years showed an isolated lupus erythematoses of the left lower lid, manifested by infiltration and redness, with scales and an atrophic white stripe, thickening of the conjunctiva, and a defective row of lashes. It had developed eighteen months after injury by a leaf at the inner canthus. A man of 33 years presented circumscribed sensitive infiltrations of the right upper and left lower lids, as early stages of lupus erythematoses of the face. Treatment included local applications of salicylic acid and ichthyol. (Illustrations.)

C. Zimmermann.

Hall, A. J. Some observations on the acts of closing and opening the eyes. *Brit. Jour. Ophth.*, 1936, v. 20, May, p. 257.

Blinking may be of reflex origin or may occur without the intervention of any obvious stimulus. A very exhaustive study of the position and movements of the eyes in sleep in several hundred adults, youths, and infants is set forth in tables. During sleep the eyeballs by slow smooth movement assume different positions, upward, laterally, or downward. The behavior of the eyeballs during and after closure of the lids was examined in 1250 normal per-

sons. It was found that in eighty percent the eyes were moved upward and in eleven percent there was no movement upward. Moving picture illustrations demonstrate this phenomenon. Winking is discussed.

D. F. Harbridge.

Ivanova, E. M. 1200 cases of external dacryocystorhinostomy. Awerbach jubilee volume, 1935, p. 160.

A review of the literature and an analysis of 1,200 operations performed by the staff of the Helmholtz hospital at Moscow during ten years. The conclusions are that the operation is indicated in all cases of dacryocystitis, and is in every respect as effective as complete extirpation of the sac. It gives excellent results in recurrences following extirpations of the sac. It is harmless, and presents no technical difficulties. Its chief advantage is in the fact that it restores normal function. Failures are due not to the method but to technical inadequacy.

Ray K. Daily.

Kirshman, I. S. Technique of anastomosing the lacrimal sac with the nose. Awerbach jubilee volume, 1935, p. 203.

A detailed description of the instrumentarium used in the Dupuy-Dutemps operation. The author has modified the Arruga electric trephines and burrs and uses a Shiraev knot-tier to tie the deep sutures in the mucous membrane. (Illustrations.)

Ray K. Daily.

Lijo Pavia, J. A new oculopalpebral syndrome. Chronic pseudomembranous tumoral keratoconjunctivitis or keratoconjunctivitis from wood. Arch. de Oft. de Buenos Aires, 1936, v. 11, April, p. 231; also Rev. Oto-Neuro-Oft., 1936, v. 11, April, p. 89.

Aside from the question of priority, Lijo Pavia having first described the condition in 1924, to be followed by Morax, Borel, and Castroviejo, the successful treatment of this case with anti-meningococcic vaccine points to the etiology.

M. Davidson.

McLeod, J., and Lux, P. Cicatricial ectropion as a result of mucocele of the frontal sinus. Arch. of Ophth., 1936, v. 15, June, pp. 994-997.

A patient aged 56 years had first no-

ticed a large painless swelling in the right upper lid twelve years previously. After incision of a mucocele of the frontal sinus a fistula resulted, producing eversion of the right upper lid. Plastic repair gave an excellent result. (Photographs.)

J. Hewitt Judd.

Rodin, F. H. Ptosis. Amer. Jour. Ophth., 1936, v. 19, July, pp. 597-599.

Rollet, J. The precorneal layer of fluid. Arch. d'Opht., 1936, v. 53, Jan., p. 5; Feb., p. 111; April, p. 255.

The thin film of fluid which covers the cornea is considered as the sixth layer and is indispensable for corneal nutrition and visual function. The lids are accessory to this fluid, not vice versa, since their function is to preserve, regulate and distribute equally the fluid. The fluid is made up of lacrimal and other glandular products and as such is highly complex. Disturbance of its formation, chemical makeup, and distribution alters its physiologic action, and thereby disturbs ocular function.

Derrick Vail.

Rollin, J. The lid slit of the Negro. Zeit. f. Augenh., 1936, v. 89, April, p. 95.

Some anthropologists believe that there are three characteristic positions of the lid slit; namely, the European which is horizontal, the Mongoloid which slants up and out, and the Negroid which slants down and out. Observations on countless negroes have convinced the author that the so-called Negroid lid slit is not characteristic of the black race, and that in this race the so-called Mongoloid type of lid slit is found more frequently than in Europeans:

F. Herbert Haessler.

Spratt, C. N. The use of Callahan tubes in the treatment of chronic dacryocystitis. Amer. Jour. Ophth., 1936, v. 19, July, pp. 601-603.

Tschekina, A. H. The Blascovicz operation for ptosis. Sovietskii Viestnik Opht., 1936, v. 8, pt. 4, p. 551.

A description of the operation and brief reports of six cases, with five satisfactory results. (Illustrations.)

Ray K. Daily.

15 TUMORS

Anthonsen, H. Plasmocytoma of the eyelid. *Det oftalmologiske Selskab i København's Forhandlinger*, 1934-1935, pp. 65-66. In *Hospitalstidende*, 1935, Dec. 17.

A man of sixty years came with a smooth, bluish-red sharply defined tumor of the left upper eyelid, extending the whole length of the lid. The surface showed a coarse network of veins and the consistence while firm was not hard. Biopsy revealed a plasmocytoma. This tumor, which occurs quite commonly in the nose and nasopharynx, is very rare around the eyes. It is very sensitive to roentgen rays and in this instance it disappeared rapidly after exposure to them. D. L. Tilderquist.

Byers, W. G. M., and MacMillan, J. A. The treatment of sarcoma of the uveal tract. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 184-201. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 369.)

Coston, T. O. Primary tumor of the optic nerve, with report of a case. *Arch. of Ophth.*, 1936, v. 15, April, pp. 696-702.

Primary tumors of the optic nerve are either intraneural tumors, the gliomas, or tumors of the nerve sheath, the meningiomas and fibromas. Characteristics of these tumors are discussed. The case reported is of a woman aged 48 years, in whom an extension to the disc was recognized ophthalmoscopically and was subsequently proved by histologic examination. The article is illustrated by a fundus photograph and photomicrographs. J. Hewitt Judd.

Friedman, M., and Engel, J. Epithelioma of the skin of the bridge of the nose. *Jour. Amer. Med. Assoc.*, 1936, v. 106, May 30, p. 1879.

The eye had completely degenerated from pressure necrosis produced by the overlying tumor, an extensive basal epithelioma originating at the inner canthus of the eye and the nasal bridge. Treatment of the lesion with massive dosage of low voltage roentgen rays (six weekly treatments of 4,000 roent-

gens) resulted in complete healing. (5 figures.) George H. Stine.

Hay, P. J. Carcinoma of choroid secondary to carcinoma of the lung. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 564.

This is the pathologic report of an eye removed for a tumor which was diagnosed as carcinoma penetrating the membrane of Bruch, and secondary to involvement of the right lower lobe of the lung. The patient died two months later with hemoptysis and consolidation of the right lower lobe.

Beulah Cushman.

Kiehle, F. A. Tumor of the optic nerve. *Arch. of Ophth.*, 1936, v. 15, April, pp. 686-691. (See *Amer. Jour. Ophth.*, 1936, v. 19, Jan., p. 82.)

Kiep, W. H. Carcinoma of choroid secondary to carcinoma of breast and of rectum. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 566.

Two cases are reported, the first in a woman of 41 years who had had a scirrhus tumor of the left breast removed 2½ years previously to a blurring of her right vision. The diagnosis of a metastatic choroidal tumor was made, and the pathologic examination corroborated the diagnosis. The patient died five months later with metastasis in the lower dorsal spine and stomach. The second patient was a man of 71 years who had had carcinoma of the bowel for two years, then complained of blurred left vision. A tumor mass found above the macular area was diagnosed as metastatic, but the eye was not removed. Beulah Cushman.

Klien, B. A. The ciliary margin of the dilator muscle of the pupil . . . melanomas of the iris. . . *Arch. of Ophth.*, 1936, v. 15, June, pp. 985-993.

The histology of the dilator muscle is discussed, together with the various tumors arising in this region. A case of malignant melanoma of the iris in a man aged 64 years is reported and is illustrated by photomicrographs. Attention is drawn to the similarity of parts of the tumor to the benign types

of melanomas and the apparent connection with the dilator muscle.

J. Hewitt Judd.

Merkulov, I. I. Ocular changes in neurofibromatosis. Averbach jubilee volume, 1935, p. 280.

Following a review of the literature the author reports two cases. One, in a ten-year old girl who had neurofibromatous nodules in the lids and scalp, was complicated with hydrophthalmos of the right eye and hypertrophy of the right side of the head. The second case, in a girl sixteen years old, is very unusual in that biomicroscopy demonstrated a number of nodules throughout both irises. (Illustrations.)

Ray K. Daily.

Pallares Lluesma, Juan. Contribution to the study of plasmoma of the conjunctiva. Arch. de Oft. Hisp-Amer., 1936, v. 36, Feb., pp. 61-77.

The author reports four cases of plasmoma of the conjunctiva in patients who had been affected with trachoma. Tissue was excised from the conjunctival growth, and microscopic study revealed it to be composed of plasma cells, connective tissue, and some hyaline substance. Treatment was carried out by excision. Scarification of the granules was followed by applications of cyanide of mercury in from 1/500 to 1/1000 solution and finally instillation of a solution of copper sulphate. Symptomatology, etiology, pathogenesis, pathologic anatomy, and treatment of the condition are briefly discussed. (3 illustrations, bibliography.)

R. Castroviejo.

Pfeiffer, R. L. Roentgenographic diagnosis of retinoblastoma. Arch. of Ophth., 1936, v. 15, May, pp. 811-821.

In the calcareous degeneration of retinoblastoma, roentgenograms show the sandy bodies in the tumor as characteristic mottled or granular shadows. In fifteen of twenty laboratory specimens, calcium shadows were shown on the roentgenograms. In eight of ten cases proved histologically, shadows of calcium were shown in the orbit before enucleation. In four cases of pseudo-

glioma no calcium was shown by roentgenographic examination before or after enucleation. Pfeiffer concludes that in 75 percent of the cases of retinoblastoma there is sufficient calcareous degeneration to be recognized roentgenographically and that the granular and irregular shadow is pathognomonic of tumor when found in children.

J. Hewitt Judd.

Pokrovskii, A. I. Neoplasms of the orbit. Averbach jubilee volume, 1935, p. 352.

The author discusses the vascular tumors of the orbit and reports in detail cases of simple angioma, cavernous angioma, and angiofibroma, as well as cases of orbital hemorrhage simulating neoplasm. The angiomas develop from embryonal rests of the vascular system, and trauma is an exciting factor in stimulation of the growth. Histologic study of the case of cavernous angioma did not support the view that it was a second stage of simple angioma caused by varicose dilatation. While these tumors are benign, the possibility of their becoming endotheliomas, and of their causing pressure atrophy of the optic nerve, indicates early removal through an incision at the orbital border. A hematoma in the walls and lumen of an ectatic lacrimal sac simulated a neoplasm in the lower inner angle of the orbit. Traumatism was not a factor in this case, and the author attributes the hemorrhage to vascular changes in the bloodvessels in chronic dacryocystitis. To illustrate the importance of not overlooking hemophilia the author reports a case of massive retrobulbar hemorrhage in a hemophiliac. Prior to discovery of the blood abnormality, one eye was enucleated with the diagnosis of orbital tumor and the other was lost from a panophthalmitis secondary to corneal ulcer. (Illustrations.)

Ray K. Daily.

Renard, G., Huguenin R., and Cassiau, P. Study of a case of dermoepithelioma of Parinaud. Arch. d'Ophth., 1936, v. 53, March, p. 197.

In 1884 Parinaud described a tumor "reddish-yellow color, semitranslucent

appearance, somewhat lobulated, situated at the external border of the cornea, movable on the sclera, and encountered in young subjects." The authors describe such a case occurring in a patient 67 years old. The tumor was situated in the region of the caruncle and was pigmented and cystic. A complete histologic description of the growth is given. (Illustrations, bibliography.)

Derrick Vail.

Soudakoff, P. S. An advanced stage of diktyoma. Report of a case. *Arch. of Ophth.*, 1936, v. 15, April, pp. 680-685.

Malignant tumors of the ciliary epithelium are either malignant epithelioma or diktyoma, a tumor resembling the undifferentiated embryonic retina. This is the ninth case of diktyoma in the literature. In the left eye of a Chinese male aged 28 years there was extensive destruction of the ocular structures by tumor cells growing chiefly in the form of bands, consisting of one or several layers of cells. In places tumor cells were arranged in groups. This is the most advanced stage of diktyoma retinae so far reported. (Photomicrographs.)

J. Hewitt Judd.

Trovati, E. Clinical and pathologic contribution to vascular neoplasias of the orbit. *Ann. di Ottal.*, 1936, v. 64, Feb., p. 91.

The author reports clinically and histologically two cases of orbital angioma. The first took origin from the deeper structures of the upper lid, extended secondarily into the orbit, and then into the conjunctiva of the upper inner fornix. The second originated in the orbital vessels. The first, poorly delimited, corresponded to the type angioma racemosum. The second, completely circumscribed, had the characteristics of ordinary cavernous angioma. (Radiographic plate and figures, bibliography.)

Park Lewis.

its prevention. Awerbach jubilee volume, 1935, p. 75.

A comparative tabulation of ocular traumatism for 1932 and 1933. The measures responsible for the diminishing number of ocular injuries are sanitation propaganda, protective spectacles, machine guards, and restriction of the use of the lathe to skilled workers. Under the educational measures are listed discussions with the workers at the machines during work, group visits of workers to the hospitals and conversations with the injured, visits of ophthalmologists of note to the factory, articles in the factory publications, and posters at the machines.

Ray K. Daily.

Berezinskaia, D. I. Acid and alkali burns of the eye. *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 3, p. 319.

A detailed report of an experimental study on rabbits. The conclusions are that five percent caustic soda penetrates within five minutes through the cornea into the anterior chamber; under the same experimental set-up the penetration of fifty percent sulphuric acid was not demonstrable. The pathologic picture of acid and alkali burns differs, that from alkali being more severe. The difference is apparent within the first hours after the injury, and is due to differing corneal penetrability to acids and alkalies. In alkali burns the process is diffuse, and involves the uvea and all parts of the cornea with the exception of Descemet's membrane. Descemet's membrane has a high resistance to acids and alkalies. In acid burns the pathologic process is circumscribed and superficial and deep penetration is due to secondary infections. In hydrochloric acid burns the corneal tissue becomes homogeneous and there are apt to be superficial scabs. Acid burns may be complicated by cataract. (Photomicrographs.)

Eliminating fireworks accidents. Discussion by various speakers. *Sight-Saving Review*, v. 5, March 1935, pp. 37-50.

In the last thirty years 4,290 Americans have been killed in fireworks accidents and 96,000 have been injured.

16

INJURIES

Berezinskaia, Wolfson, Gornetz, Itzikson, and Epstein. Ocular traumatism at the "Manometr" Industrial plant and

Cities having model fireworks ordinances have as many accidents as those having no regulation of the sale of fireworks, because it is impossible to control the sale of fireworks in small shops and in roadside stands. The only means of effective control lies in restricting sale at the factory and a resolution is presented restricting the sale of fireworks to (1) Army and Navy departments of the United States government; (2) railroads, steamship and aviation lines, and other industrial or commercial concerns requiring pyrotechnics for the normal conduct of their business; (3) federal, state, municipal, or county governments and such clubs or associations as can guarantee that fireworks will be discharged on their premises by pyrotechnic experts.

Edna M. Reynolds.

Espildora Luque, C. Meningeal reaction in sympathetic ophthalmia and penetrating ocular wounds. *Arch. de Oft. Hisp.-Amer.*, 1936, v. 36, Feb., p. 90. (See Section 7, Uveal tract, sympathetic disease and aqueous humor.)

Farberov, B. Bone-free roentgenography of the anterior ocular segment. Averbach jubilee volume, 1935, p. 541.

Having demonstrated foreign bodies with this method in nineteen cases in which the usual X-ray photographs were negative, the author concludes that the method should be used in all cases in which roentgenography is negative and the history of the case points to an intraocular foreign body.

Ray K. Daily.

Keller, J. M. Retinal periphlebitis in septic endophthalmitis and its ophthalmoscopic picture. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 520-533. (See Section 10, Retina and Vitreous.)

Korenevich, I. Electromagnet operation. *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 4, p. 597.

An exhaustive study of ninety foreign-body magnet extractions. The study shows 8.1 percent of loss of function in diascleral extraction of foreign bodies from the posterior ocular segment and 25 percent loss in extractions

through the anterior chamber. The least favorable functional results were obtained in the extraction of the foreign body through the original point of entry. Extractions within the first few days after the injury resulted in 16.7 percent functional loss, while in delayed extractions the vision was lost in only 4.8 percent of the eyes. Hospitalization was longer in extractions by the anterior than by the posterior route.

Ray K. Daily.

MacDonald, A. E. A practical method to test the strength of ophthalmic magnets. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 403-404.

A 1/16-inch steel ball bearing is attached to a 2 or 3-inch silkworm-gut bristle with celloidin. The free end of the bristle is then inserted into an ordinary rifle cartridge filled with lead weighing about 50 gm. To test the strength of the magnet, weights are added until contact is broken. For measuring weak pulls, when the object is separated from the magnet, wooden cases are used which are constructed to receive a mercury or sand drip.

C. Allen Dickey.

Renedo, M. War gases in ophthalmology. *Arch. de Oft. Hisp.-Amer.* 1936, v. 36, April, pp. 179-208.

The author enumerates the different gases used in warfare since ancient times. Modern war gases are classified as lacrimogenous, sneezing, asphyxiating, vesicating, toxic for the nervous system, and toxic for the blood. Symptoms are briefly described, with special reference to those produced upon the visual apparatus. These vary from slight irritation of the conjunctiva to severe corneal ulcers, with marked photophobia and blepharospasm. Curative treatment varies according to the nature of the gas causing the condition. As a rule frequent irrigation with a mild antiseptic is the treatment of choice.

R. Castroviejo.

Samuels, Bernard. Chronic postoperative or posttraumatic retinitis (retinitis serosa). *Amer. Jour. Ophth.*, 1936, v. 19, June, pp. 493-503; also *Trans. Amer. Ophth. Soc.*, 1935, v. 33, p. 291.

Thorpe, H. E. A new forceps for removal of lead shot from the vitreous. *Trans. Sec. on Ophth., Amer. Med. Assoc.*, 1935, 86th annual session, p. 336. (See *Amer. Jour. Ophth.*, 1936, v. 19, July, p. 637.)

Vinogorov, D. P., and Kopit, R. Z. Alkali burns of the eyeball. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 3, p. 333.

A detailed report of experimental studies on guinea pigs. The conclusions are that five-percent solutions cause necrosis of the corneal epithelium and endothelium, and may produce Greef cysts in the ciliary body as well as retinal edema. Greef cysts are not found in burns with concentrated alkali, because of rapid destruction of the ciliary body. Weak alkali solutions may cause subcapsular cataract. Strong solutions produce necrosis of the lids, conjunctiva, cornea, ciliary body, iris, and of the epithelium of the lens. Morgagnian spheres may be seen as consequences of deep changes in the vitreous. Descemet's membrane is the most resistant portion of the eyeball, being free from changes in burns with fifty percent solutions. (Photomicrographs.)

Ray K. Daily.

17

SYSTEMIC DISEASES AND PARASITES

Archangelskii, P. F. Spotted typhus and the eye. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 4, p. 509.

A critical analysis of the literature on the subject. The author affirms his conclusions published in 1920 that involvement of the optic nerve is characteristic of spotted typhus, just as involvement of the anterior segment of the eyeball is typical of relapsing typhus.

Ray K. Daily.

Bedell, A. J. A case of tumor of the antrum involving the eye. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 404-405.

A tumor between the upper incisor teeth developed in a patient aged 47 years. Following removal, there was rapid recurrence with extension into both antrums and the hard palate. In spite of repeated removal and massive

doses of radium the growth enlarged until practically all of the face was involved. Acute nephritis followed intensive arsenic therapy but the Wassermann reaction remained positive. The tumor was diagnosed as chondrosarcoma and later osteogenic sarcoma.

C. Allen Dickey.

Biozzi, Giuseppe. Ocular manifestations of the sphenopalatine ganglion syndrome. *Riv. Oto-Neuro-Oft.*, 1935, v. 12, Nov.-Dec., pp. 730-737.

A man of 36 years had been affected for a month by intense redness and catarrhal secretion of the left eye, photophobia, pin-prick sensation, and violent coryza with obstruction of the corresponding nasal cavity and abundant watery secretion. Conjunctival injection was more marked temporally, where small nodules formed by blood vessels were visible with the slit-lamp, and minute epithelial defects were shown by fluorescein. A woman of 32 years had been suffering for a few years with recurrent bilateral attacks of palpebral edema, redness of the conjunctiva, photophobia and lacrimation more marked at night, violent pain in the globe and the left side of the head, obstruction of the right nasal fossa, and abundant secretion of clear aqueous fluid. The slit-lamp showed small opacities and superficial vascularization of the cornea. The writer thinks that corneal trophic disturbances arise through a nerve filament which connects the sphenopalatine with the ciliary ganglion. This filament is not constant, which fact explains why the cornea does not in all cases participate in the sphenopalatine syndrome. (Bibliography.)

M. Lombardo.

Buschke, Wilhelm. Vitamins in ophthalmology. *Zeit. f. Vitaminforschung*, 1936, v. 5, Jan., pp. 37-68. (Reprint.)

This is a general review of the literature of the subject for recent years to the beginning of 1936, the effect of each vitamin upon the individual structures of the eye being dealt with.

Dalsgaard-Nielson, Esther. Basal radiculomeningitis complicating oph-

thalmic herpes zoster. Det oftalmologiske Selskab i Köbenhavn's Forhandler, 1934-1935, pp. 56-58. In Hospitalstidende, 1935, Dec. 17.

A woman of 76 years suffered from typical herpes zoster, of sudden onset, on the left side of the head and involving the left eye. Two weeks later, in rapid succession, the following condition developed in the left eye: loss of vision, glaucoma with iridocyclitis, paralysis of all the eye muscles, and exophthalmos. Aseptic thrombosis of the cavernous sinus, infection of the nasal sinuses, aneurism at the base of the brain, tumor of the brain, and localized meningitis were all considered in making a differential diagnosis. All the evidence was in favor of the last. The infection of the Gasserian ganglion which was assumed to have caused the herpes zoster could have spread to the adjoining meninges and cranial nerves and have given rise to all the symptoms. Six weeks after onset marked improvement had already taken place.

D. L. Tilderquist.

Jess, A. Relationship between the spring and eye diseases. Deut. med. Woch., 1936, no. 16, April 17, p. 627.

Jess mentions these diseases as being commonest in the spring: spring catarrh, acute lid edema and conjunctival chemosis due to spring flowers, rosacea conjunctivitis and keratitis, scrofulous keratitis, keratomalacia, night blindness, and glaucoma.

Theodore M. Shapira.

Katznelson, A. B. Relation between scrofulous and tuberculous disease of the eye. Averbach jubilee volume, 1935, p. 196.

A review of the literature and a study of the clinical history, with records of 37 cases of tuberculosis of the anterior segment and 37 cases of tuberculosis of the posterior segment. The study shows that 91 percent of patients with tuberculosis of the anterior segment and 10 percent with tuberculosis of the posterior segment had phlyctenular conjunctivitis in childhood. The author therefore urges that children with scrofulous eye diseases should be placed

under observation of the children's health department, and should have all types of social and medical assistance.

Ray K. Daily.

Kazas, I. I. Interruption of pregnancy and the eye. Averbach jubilee volume, 1935, p. 177.

A comprehensive description of the toxemias of pregnancy and the associated changes in metabolism. The author advocates immediate interruption of pregnancy for diseases of the light perception apparatus, for ulcerative keratitis, and for increased vitreous opacities in myopia. Optic neuritis and ulcerative keratitis in nursing mothers call for weaning of the child. High myopia is affected adversely by pregnancy, and high myopes should be advised not to bear children.

Ray K. Daily.

Melkin, B. M. Blood transfusion in ophthalmology. Averbach jubilee volume, 1935, p. 253.

Reference is made to Archangelskii's use of blood transfusions for vitreous opacities and the research possibilities of blood typing are pointed out. A review of the literature and tabulated findings of blood typing in 358 persons with various ocular diseases point to some interesting possibilities in this field. The data show the preponderance of group O in retinitis pigmentosa and of group A in optic atrophy. Senile cataracts are represented in all blood types, but the severe postoperative infections fall in type A. The maximum number of cases of inflammatory glaucoma is seen in type A and the minimum in type O. The maximum number of cases of simple glaucoma is in type O and the minimum in type B. Absolute glaucoma is seen most frequently in types A and B. The author urges blood typing on a large scale, in the hope of finding the blood type related to constitutional predispositions to disease.

Ray K. Daily.

Sergievsckii, I. I. Tuberculosis and the eye. Averbach jubilee volume, 1935, p. 422.

A discussion of the action of tuberculin and a detailed description of the

Vienna method of treatment with tebe-protein. The author urges as diagnostic measures a general examination, roentgenography of the chest, tuberculin test, culture of the blood for tubercle bacilli, and slitlamp examination. In differential diagnosis syphilis and focal infection have to be eliminated. Because of the excellent general condition of patients with ocular tuberculosis they respond well to tuberculin therapy, which does not develop permanent immunity but saves many eyes which would otherwise be enucleated. An eye blind from a tuberculous lesion should be enucleated to protect the other eye from sympathetic ophthalmia. The diagnostic dose of tuberculin should avoid a pronounced focal reaction. The diagnostic dose which causes a suspicion of focal reaction should be the initial therapeutic dose. Nonspecific parenteral protein therapy and heavy metals act well in conjunction with tuberculin.

Ray K. Daily.

Spangol, V. Removal of the larva of a fly from the anterior chamber of a boy of eleven years. *Klin. M. f. Augenh.*, 1936, v. 36, April, p. 494.

A boy of eleven years, son of a cowherd whom he assisted, noted for two months impairment of vision in his left eye without pain. Two weeks before admission he complained of severe pain in the eye. In the fold of the upper lid were two small cicatricial depressions, corresponding to a small scar in the upper fornix. The conjunctiva was injected, the cornea somewhat dull, the iris hyperemic and cloudy, the pupil dilated and without reaction. In the lower angle of the anterior chamber was a wormlike yellowish green object lying on the posterior surface of the cornea. Extracted, it proved to be a living larva of a fly of the species of *Wohlfartia magnifica*, which probably had entered the vitreous through the sclera. The severe pain which the patient felt two weeks before admission likely occurred when the larva penetrated the root of the iris. The affection ended with phthisis bulbi. (Illustrations.) C. Zimmermann.

Spector, S. A. Ocular diseases in lupus. Averbach jubilee volume, 1935, p. 439.

A tabulation of the ocular complications of 662 patients at the Moscow lupus sanitarium. The table shows that 88 percent of the patients had ocular complications, mostly of the lids, cornea, and lacrimal sac. The ulcerative type of lupus invades the conjunctiva, particularly in the presence of ectropion, and a plastic operation for ectropion in this disease should be regarded as an important prophylactic measure. Phlyctenular keratitis is the most frequent corneal disease and runs a severe course. The primary involvement of the lacrimal sac is usually a peridacryocystitis extending from the nose. Women are affected more frequently than men because their lacrimal fossa is usually formed by the thin lacrimal bone. The lacrimal fossa of men, formed by the heavier bone of the nasal process of the superior maxilla, serves as a better barrier to infection. (Illustrations.)

Ray K. Daily.

Velhagen, K., Jr. Isolated observations on endocrine disturbances and eye. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 577.

The following cases are reported: simultaneous occurrence of Graves's disease, acromegaly and glaucoma simplex in a woman of forty years; late retinitis pigmentosa in pernicious anemia of a man aged 61 years; acute keratoconus in different trophic disorders, doubtfully related to disturbances of thyroid or parathyroid glands, in a woman aged 38 years. Peculiar tapetoretinal degeneration (drusen) with hypophyseal tumor in a woman of 37 years. The endocrine problem is discussed.

C. Zimmermann.

18

HYGIENE, SOCIOLOGY, EDUCATION, HISTORY

Averbach, Michail Josephovich. Averbach volume, 1935, p. 7.

An appreciation of the ophthalmologist who is the founder and professor of the eye clinic of the Second Moscow

Medical Institute, chief ophthalmologist of the Helmholtz Hospital (the largest eye hospital in Europe, which has become under his initiative the Helmholtz Institute of Research and Clinical Ophthalmology), and director of the eye department of the Central Postgraduate Institute. He is also a founder of the Moscow Ophthalmological Society, and editor in chief of the *Sovietskii Viestnik Ophthalmologii*. Educated and bred under the Czarist régime, he took a sincere part in the new social structure of Russia and became one of the leaders in the conservation of public health. This volume, issued by his colleagues and coworkers in 1935, celebrates his forty years of medical activity.

Ray K. Daily.

Berens, C., Kerby, C. E., and McKay, E. C. The causes of blindness in children; their relation to preventive ophthalmology. *Trans. Sec. on Ophth.*, 1935, 86th annual session, pp. 70-85. (See *Amer. Jour. Ophth.*, 1936, v. 19, March, p. 283.)

Berens, Conrad. The talking book. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 405-407.

The American Foundation for the Blind devised the "talking book," which reproduces the ordinary book in about twelve phonographic records, each record lasting approximately forty minutes. It requires the talking-book machine, which was especially designed for it. These discs may be obtained free of charge on a library-loan basis from any library having a department for the blind.

C. Allen Dickey.

Berezinskaia, D. I. Data on the relation between refraction, vocation, and vocational selection. *Awerbach jubilee volume*, 1935, p. 66.

The author collected data on visual acuity with and without correction, vocation, and length of employment of 1,500 candidates for military service, 62 percent being emmetropic, 26.7 percent hypermetropic, and 11.1 percent myopic. Vocationally the men were divided into three groups: those employed in educational pursuits, and skilled and unskilled labor. The majority of the people in the three groups

were emmetropes. Hyperopia varied between 21 percent and 26.68 percent. But myopia was three times as frequent in those employed in educational pursuits as in the other two. The lowest percentage of refractive errors is found among skilled workers because they represent a selected group.

Ray K. Daily.

Birich, T. V., and Shapiro, P. H. The condition of the visual apparatus among those subject to military service for the last three years in the Minsk district. *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 3, p. 449.

Examination of the young men called to service during the last three years shows a decided advance of health standards, due to the public health measures instituted during the last ten years. The incidence of trachoma as well as the number of men unfit for service is declining.

Ray K. Daily.

Contino, A. Functional loss and industrial disability in eye injuries. *Ann. di Ottal.*, 1936, v. 64, Feb., p. 73.

In Italy it is legally established that loss of one eye represents a loss of 35 percent and of the second eye of 65 percent. It has been generally agreed that the working capacity has not been impaired unless a loss greater than 2/10 has been sustained. The author considers methods determined by arithmetic and geometric progression and the estimated losses due to perimacular scotoma and other causes. By the new law going into effect on July 1, 1936, the minimum percentage of loss compensable will be raised from five to eleven percent, equivalent (according to the table used) to a loss of visual acuity (Snellen) of 0.4 to 0.5. The author thinks the minimum loss compensable should be reduced to eight percent.

Park Lewis.

Contribution of statistics to the prevention of blindness. *Sight-Saving Review*, 1935, v. 5, March, pp. 1-36.

A plan for standardization of statistics regarding the blind is outlined. Different degrees of blindness are specifically defined. A classification of the causes of blindness in twenty schools for the blind is given. The im-

portance of adequate ophthalmologic service for every institution and class for the blind is emphasized with a view to securing improvement of vision by treatment whenever possible and transferring to sight-saving classes children who have sufficient vision for education in the public schools.

Edna M. Reynolds.

Danielson, R. W., and Walker, C. E., Jr. Optometric propaganda in recent encyclopedias. *Amer. Jour. Ophth.*, 1936, v. 19, July, pp. 603-605.

Greeff, R. An ophthalmologic museum. *Klin. M. f. Augenh.*, 1936, v. 96, April, p. 511.

Greeff gives a description of the ophthalmologic museum recently opened at Berlin as part of the Medico-historical Collection. It contains spectacles and ophthalmologic instruments, 67 different ophthalmoscopes commencing with the first ophthalmoscope constructed and used by Helmholtz, historical pictures, and so on. The author solicits contributions of old instruments and appliances, addressed to the Empress Frederic House for Medical Progress, Berlin, N.W. 7, Robert-Koch Platz 7. (Illustrations.)

C. Zimmermann.

Lloyd, R. I. Evolution of perimetry. *Arch. of Ophth.*, 1936, v. 15, April, pp. 713-732.

A detailed historical review of the development of the methods employed in examination of the visual fields is presented. (Illustrations.)

J. Hewitt Judd.

Majewski, Kasimier. The vision of Jean Matejko. *Klinika Oczna*, 1936, v. 14, pt. 1, p. 66.

The style of the historical canvases of this Polish artist, characterized by careful reproduction of fine details of the background, is attributed by the author to the fact that the artist was highly myopic.

Ray K. Daily.

Martzlin-Uroda, M. S. The data of the Saratov Eye Clinic on the causes of blindness. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 3, p. 458.

A statistical study based on 43,494 patients seen at the Saratov eye clinic

during five years. The study shows a decided fall in the number of cases of blindness due to trachoma, small pox, and gonorrhea. In prerevolutionary Russia trachoma occupied first place as cause of blindness, small pox fourth, and gonorrhea fifth. The present data place trachoma in the fourth place, small pox seventh and gonorrhea thirteenth. The improvement is due to the social economic shift and raised cultural and sanitary standards. Because of technical efficiency and safety measures the industrialization of the country did not increase the number of cases of blindness caused by injury. At present glaucoma leads the list of causes of blindness.

Ray K. Daily.

Narog, Franciszek. Types of daltonism and their diagnosis in the railway service. *Klinika Oczna*, 1936, v. 14, pt. 1, p. 45.

Of 101 color defectives found among railway employees 5 were red-and-green blind, 25 green blind, and 56 red-and-green defectives. The author proposes three categories of color standards for the railway service, patterned after the color requirements of the English marine.

Ray K. Daily.

Pilman, H. The condition of the ocular segment in workers with synthetic rubber. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 4, p. 618.

With development of this industry the sanitary-hygienic laboratory undertook to study its vocational hazards. The chief detrimental feature is the gases liberated in the atmosphere, which have narcotic qualities and are irritating to mucous membranes. Ocular examination showed prevalence of conjunctivitis. The recommendation is complete hermetization of all machinery.

Ray K. Daily.

Prenatal and congenital infections in relation to blindness and impaired vision. Discussion by various speakers. *Sight-Saving Review*, 1935, v. 5, March, pp. 51-69.

Joseph V. Klauder of Philadelphia discussed interstitial keratitis and optic atrophy as the most serious manifestations of syphilis causing blindness. John

L. Rice, Health Commissioner of the city of New York, reported that seventy percent of pregnant women did not report at prenatal clinics for examination until after the fifth month. This he regards as one of the main causes of congenital syphilis, since treatment after this time is of very little value in preventing infection of the child. Max J. Exner of the American Social Hygiene Association expressed the wish that it might be feasible to have a compulsory blood test for every pregnant woman, since such excellent results had been obtained from the law in regard to ophthalmia neonatorum.

Edna M. Reynolds.

Strebel, J. Diagnosis and significance of anisometropia of artists. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 675.

The examination of an artist verified the diagnosis of anisometropia which Strebel had inferred from the peculiarities of the former's drawings. He reports on his studies of the works of other artists. (Illustrations.)

C. Zimmermann.

Vannas, Mauno. Väinö Grönholm. *Klin. M. f. Augenh.*, 1936, v. 96, May, p. 683.

An obituary. (Photograph.)

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Irvine, S. R. Histology of the extraocular muscles. *Arch. of Ophth.*, 1936, v. 15, May, pp. 847-858.

The literature on the embryology, histology, and innervation of the extraocular muscles is reviewed. The histologic peculiarities that distinguish the ocular from other striate muscles are presented. Embryologically in man there is a possibility of splanchnic origin for the ocular muscles. The innervation of the ocular muscles is remarkable for its abundance and for certain peculiar nerve endings, but they contain fewer muscle spindles than other striated muscles. Irvin concludes that from an anatomic point of view the extrinsic ocular neuromuscular system of man is phylogenically earlier than the

striated musculature anywhere else in the body, and that there is relatively little anatomic evidence for ocular proprioceptive sense. J. Hewitt Judd.

Neher, E. M. The origin of the Brille in *Crotalus confluentus lutosus* (Great Basin rattlesnake). *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 533-545.

Neher discusses the rattlesnake eye and the histologic structure of the "Brille" (or "spectacle"). Embryos obtained from snakes kept in confinement for eleven months were studied and the origin of the Brille determined. The paper does not lend itself to abstract.

C. Allen Dickey.

Polyak, S. Minute structure of the retina in monkeys and in apes. *Arch. of Ophth.*, 1936, v. 15, March, pp. 477-519.

The report is based on study of the retina of the adult rhesus monkey and of the chimpanzee by the method of Golgi. Each layer in seven circular subdivisions of the retina is thoroughly described and illustrated by drawings. The author concludes that there is one variety of rods and of cones present throughout all regions of the retina but the morphologic details vary from region to region. Only one variety of horizontal cells was present, although varying greatly in dimensions. Three fundamentally different varieties of bipolar cells and of amacrine cells were found. Six varieties of ganglion cells are described. Müller's fibers were found to form an insulating system open only at the points of synapses, thus indicating that the neurons are independent nerve cells. (Bibliography.)

J. Hewitt Judd.

Reiser, K. A. Innervation of the human sclera. *Arch. f. Augenh.*, 1936, v. 109, May, p. 481.

Plexuses of the first and second order are formed in the sclera by nerve fibers of different thickness. Plexuses of the first order have a larger caliber and more medullated nerve fibers than plexuses of the second order. From the larger nerve meshes very fine bundles consisting of 6 to 8 fibrils are sent out which, while anastomosing numerously

among themselves, form a very fine preterminal network. From the latter the diffuse terminal reticulum takes its origin, a syncytial nerve-end formation consisting of numerous small meshes whose fibrils surround and traverse the connective tissue cells. Each nerve fiber is surrounded by a nucleated Schwann's plasm, which loses its identity as the terminal nerve fiber enters the plasm of the end cell. The morphology of the terminal reticulum proves the syncytial construction of the intrascleral nerve system. R. Grunfeld.

Samuels, Bernard. *Recessus hyaloideo-capsularis*. Trans. Ophth. Soc. United Kingdom. 1935, v. 55, p. 507.

The author describes the recessus hyaloideo-capsularis as triangular, the apex resting on the annular ligamentum hyaloideo-capsulare. The sides are bounded by the curved outlines of the capsule anteriorly and of the anterior limiting layer of the vitreous posteriorly, or in general the recessus belongs to that division of the posterior chamber known as the circumlental space. The space was first described by E. Fuchs and was given the above name by A. Fuchs. Pigment was found in the recessus in glaucoma and diabetes. Tumor cells were found in the recessus in a specimen of intraocular sarcoma. The author concludes that extraneous material can be recognized in the recessus if it possesses color.

Beulah Cushman.

Uribe Troncoso, M., and Castroviejo, R. *Microanatomy of the eye with the slitlamp microscope. Comparative anatomy of the angle of the anterior chamber in . . . mammalia*. Amer. Jour. Ophth., 1936, v. 19, May, pp. 371-384; June, pp. 481-492; July, pp. 583-596. (Profusely illustrated.)

Verrier, M. *Studies of the vertebrate retina*. Arch d'Opht., 1936, v. 53, May, p. 363.

This comparative study does not lend itself to abstracting. Some retinal cells are rods in their inner segment and cones in their outer segment, and the inverse is no less frequent. In the fovea are observed decrease in size and in-

crease in height of the visual cells. Oil droplets are reduced more and more until they become indistinct. Even in the depths of the fovea and at the edge of the depression the receptor elements have the typical rod form. The pH of the retina of various species is alkaline in some, acid in others.

Derrick Vail.

Vila-Coro, Antonio. *Anatomy of Zinn's ring*. Klin. M. f. Augenh., 1936, v. 36, April, p. 477.

According to his detailed anatomic observations Vila-Coro proposes as a more correct designation for the path between the orbit and interior of the skull "Zinn's fissure" instead of "Zinn's ring." (Illustrations.)

C. Zimmermann.

Vila-Coro, Antonio. *Posterior insertion of the muscles of the orbit*. Klin. M. f. Augenh., 1936, v. 96, April, p. 466.

From his studies of several hundred anatomic specimens the author gives an exact account of the posterior insertion of each muscle of the orbit, correcting erroneous views existing since Zinn's first descriptions. (Illustrations.)

C. Zimmermann.

Vos, T. A. *Embryonic formation of synechiae between the rim of the optic vesicle and the lens*. Klin. M. f. Augenh., 1936, v. 96, April, p. 452.

Eight cases of microphthalmos are described with formation of a membrane between lens and ocular walls, consisting of uveal and retinal parts. It was produced by embryonic formation of synechiae between the lens and the rim of the ocular cup, on the basis of isolated degeneration of the rim of the optic vesicle. One eye presented a congenital connection between lens and retina. Accessory findings were colobomas, fibrous pseudolens, iris cysts, and circular detachment of the retina with the optic nerve drawn inward. Finally the possibility is mentioned that the presence of a synechia may serve as path for the hyaloid artery, which would explain persistence of this artery in a large number of cases. (Illustrations.)

C. Zimmermann.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth
640 S. Kingshighway, St. Louis

News items should reach the editor by the twelfth of the month.

Deaths

Dr. Archibald Campbell MacLeish, Los Angeles, died May 3, 1936, aged 52 years.

Miscellaneous

The reorganized department of Ophthalmology, Long Island College of Medicine, has recently established two fellowships. Those interested in medical education will wish to study the plan under which these fellowships are conducted, a statement of which will be presented at a later date.

The Emergency Relief Bureau of the City of New York has selected four ophthalmologists to make eye examinations of special cases coming under its care. It is perhaps significant that special consideration was given men who were able to present the certificate of the American Board for Ophthalmic Examinations.

Societies

The First European Congress of Structural Surgery will be held at Brussels, Octo-

ber 3 and 4, 1936, under the direction of Dr. Coelst of Brussels, president, and Dr. Pomfret Kilner of London and Professor Savennero-Rosselli of Milan, vice-presidents. The program will be devoted especially to reparative surgery, less emphasis being placed upon esthetic surgery. The complete program will be published shortly. Inquiries should be addressed to Dr. Coelst, President of the Executive Committee, 118 Avenue Louise, Brussels, Belgium.

Personals

Dr. John Ohly is spending his vacation in the British Isles. He is leaving on July 18th and expects to return to Brooklyn in time for the meeting of the American Academy of Ophthalmology and Otolaryngology.

Dr. Frank Mallon, Assistant Attending Ophthalmologist, Long Island College Hospital, is vacationing in England and the Continent.

Dr. P. Chalmers Jameson gave a very interesting and instructive talk at the Brooklyn Eye and Ear Hospital on the subject of scleral fixation in strabismus, on July 16th.

ZEISS

OPHTHALMOLOGICAL INSTRUMENTS

Large & Simplified Gullstrand
Ophthalmoscopes

Nordenson Retinal Camera

Anterior Segment Camera

Comberg Slitlamp Apparatus

New Self Recording Perimeter

Birch-Hirschfeld Retinal
Photometer

Ophthalmic Lenses, Contact Glass

Test Sets, and many other
accessories

will be displayed at Booths 29 & 30 during the Meeting of the American Academy of Ophthalmology & Otolaryngology at the Waldorf Astoria, New York, September 26th to October 3rd.

CARL ZEISS, INC.

485 Fifth Ave.
NEW YORK

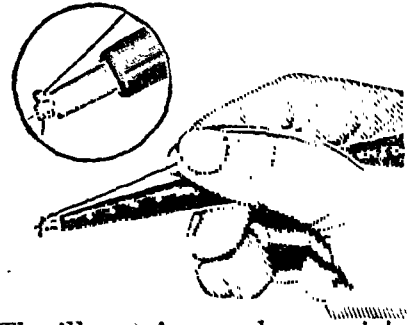
728 So. Hill St.
LOS ANGELES



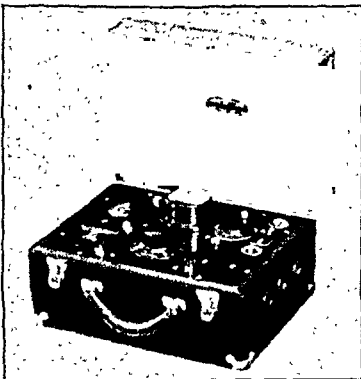
OPHTHALMIC HIGH FREQUENCY UNIT

For the treatment of Retinal Detachment
By CLIFFORD B. WALKER, M.D.

A distinguishing feature of the Walker Unit is its ability to produce an unprecedented minimum current volume with a wide enough latitude of control to assure accuracy of dosage. Entire control of current intensity is by one dial—by advancing or retarding this dial greater or lesser amounts of current are immediately available. Small, compact, portable, absolutely safe, and



easy to operate. The illustration on the top right shows the position of the bakelite handle in the hand with thread attached to the micro-pin and held between the thumb and index finger. Inset is an enlargement of the coil-like iridium platinum micro-pin with thread attached. Complete information sent on request.



V. MUELLER & CO.

SURGEONS' INSTRUMENTS Since 1895 HOSPITAL SUPPLIES & EQUIPMENT

OGDEN AVE. - VAN BUREN and HONORE STREETS
CHICAGO, ILL.

THE SIGHT-SAVING REVIEW

LEWIS H. CARRIS, *Editor*

ISOBEL JANOWICH, *Managing Editor*

Board of Editors

Mary Beard, R.N.

E. V. L. Brown, M.D.

A. J. Chesley, M.D.

Percy W. Cobb, M.D.

Gladys Dunlop Matlock

Mary V. Hun

Edward Jackson, M.D.

A. B. Meredith

A. L. Powell

C. O. Sappington, M.D.

William F. Snow, M.D.

Thomas D. Wood, M.D.

June Table of Contents

Glaucoma, Philip A. Halper, M.D., F.A.C.S.

Eye Conditions Prevalent in Preschool Age, Charles A. Hargitt, M.D.

Accidents in Traffic and Industry as Related to the Psychology of Vision, T. W. Forbes, Ph.D.

Telescopic Spectacles, Willis S. Knighton, M.D.

The Eye in Industry, James H. Andrew, M.D., F.A.C.S.

Vocational Opportunities for Sight-Saving Class Students, Charles E. O'Toole

Goggles, Ralph W. Walder

Editorial:

Eyes on Vacation

Note and Comment; Current Articles of Interest; Book Reviews

The Proceedings of the Society's Annual Conference is being sent as a supplement to all subscribers to the SIGHT-SAVING REVIEW.

THE SIGHT-SAVING REVIEW

Subscription \$2 a year; (sample copy free)

Published by the

National Society for the Prevention of Blindness, Inc.

50 West 50th Street, New York, N.Y.

BOSTON, MASS.

Bartlett & Son Company
346 Boylston Street
Specialists in the making of Eyeglasses
and Spectacles from Oculists' prescriptions.

Boston, Mass.

Pinkham & Smith Company
292 Boylston Street
15 Bromfield Street
Established 1896
Member Guild of Prescription
Opticians of America

BROOKLYN, N.Y.

J. H. Penny, Inc.
144 Toraemon St.
Medical Arts Building

BUFFALO, N.Y.

Buffalo Optical Company
559 Main Street
Peter Meyer, Oscar Cleal, Herbert Derrick
—Established 35 Years—
Member Guild of Prescription Opticians of
America

CHICAGO, ILL.

Almer Coe & Company, Opticians
105 N. Wabash Ave. (Three other Stores)
Bausch & Lomb Ophth. Instruments
Carl Zeiss (Jena) Microscopes
Carl Zeiss Telescopic Spectacles for
Diagnosis and Surgery
Carl Zeiss Spectacle Magnifiers

DENVER, COLO.

Symonds-Atkinson Optical Company
424 Sixteenth Street
Denver's only strictly dispensing opticians

DENVER, COLO.

Paul Weiss, 1620 Arapahoe Street
Prescription Optician
FUSION TUBES
OPTICAL DEMONSTRATION SETS
Optical Specialties made to order.

EAST ORANGE, N.J.

H. C. Deuchler
Guildcraft Optician
541 Main Street
Eye Physicians prescriptions exclusively
Member Guild of Prescription Opticians
of America

PORTLAND, ORE.

Hal H. Moor, 315 Mayer Bldg.
Dispensing Optician
Oculists' prescriptions exclusively

PASADENA, CALIF.

Arthur Heimann
Guild Optician
36 N. Madison Ave.

NEWARK, N.J.

J. C. Reiss, Optician
Dispensing Exclusively
10 HILL STREET
Oldest Optical House in New Jersey
Established 1892
Member Guild of Prescription Opticians
America

New York City

E. B. Meyrowitz
INCORPORATED

Optician Established 1875
520 Fifth Ave., New York
255 Livingston St., Brooklyn
Member Guild of Prescription Opticians of
America

PHILADELPHIA, PA.



Prescription Opticians—since 1890

SAN FRANCISCO, CALIF.

John F. Wooster Company
234 Stockton St.
Prescription Opticians

ST. LOUIS, MO.

Erker Bros. Optical Co.
610 Olive Street
518 N. Grand Boulevard
Established 1879
Member Guild of Prescription Opticians of
America



Pat. Nos.
236271/24
322297/28

LONDON ENGLAND
THEODORE HAMBLIN, LTD.
DISPENSING OPTICIANS (EXCLUSIVELY)
15 WIGMORE STREET, LONDON W.1.

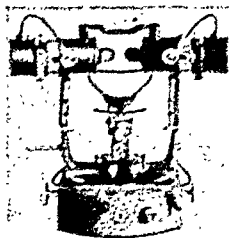
PATENTEES OF

"SPECLETTES"

THE POPULAR FOLDING SPECTACLES

MADE FOR THE AMERICAN MARKET BY

The May Manufacturing Co., Inc., 146 West 29th St., New York



THE PUGH
ORTHOPTOSCOPE
The most
modern apparatus
for orthoptic training

Columbia University
NEW YORK POST-GRADUATE MEDICAL SCHOOL
Offers Courses in
OPHTHALMOLOGY

Under the direction of Dr. Martin Cohen

I. For the Ophthalmologist

Courses are provided to give advanced instruction in these subjects:

Ophthalmic Anatomy

Histology and Pathology (an excellent collection of pathological material is available for study)

Motor Anomalies (an intensive course of one week)

Physiological Optics

Operative Surgery of the Eye

Slit Lamp (Also other subjects by arrangement)

II. For the General Practitioner

Instruction in Medical Ophthalmology and Industrial Ophthalmology is provided on Monday and Thursday afternoons, by means of lectures, practical demonstrations, and examination of patients.

For further information, address

The Director, 315 East 20th Street, New York City

TO: AMERICAN JOURNAL READERS

Dr. _____

Address _____

State _____

City _____

for INFORMATION ON THE INSTRUMENT
THAT BRINGS EYE COMFORT " "

GLASSES ALONE, as many practitioners have discovered, do not always bring complete eye comfort! That is why so many Ophthalmologists have added Orthoptic Training to their services for patients. And, the instrument that is being used to bring about *complete* eye comfort for the many muscular imbalance cases is the Wottring ROTOSCOPE—the recognized leader in Orthoptic Training! This instrument is bringing results in cases of amblyopia, lack of convergence, and those of difficult "squint." For further information at no obligation—

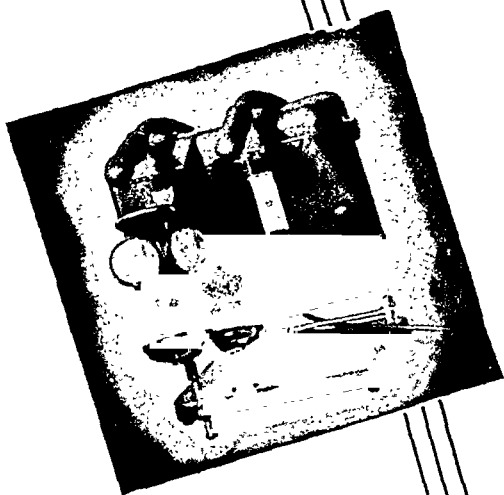
JUST RETURN the above
request to any firm listed below

D I S T R I B U T O R S O F T H E W O T T R I N G R O T O S C O P E

- COLONIAL OPTICAL CO.
62 West 47th Street, New York
- McINTIRE, MAGEE & BROWN CO.
9th and Sansom Streets, Philadelphia
- RIGGS OPTICAL COMPANY
1449 Merchandise Mart, Chicago

- IMPERIAL OPTICAL CO.
Toronto, Canada
- NATIONAL OPTICAL CO., Ltd.
Montreal, Canada

- RIGGS - ASSOCIATED OPTICAL CO.
Flood Bldg., San Francisco, Calif.
- SOUTHEASTERN OPTICAL CO., Inc.
Richmond, Va.
- THE WHITE - HAINES OPTICAL CO.
Columbus, Ohio



IF LENSES WERE ONLY AS LARGE
AS THEIR ACCURATE AREAS...



Ordinary lenses are accurate only at their centers . . . so if *only the accurate portion* of a lens could be worn, such a picture as the gentleman above presents would be a commonplace . . . and you'd be reminded to prescribe Tillyer Lenses.

For this gentleman who appears to be fitted with glasses similar to those fashionable in the days of George Washington is, in reality, wearing a pair of ordinary lenses which have been edged to their corrected areas.

Contrast this with the gentleman at the right who is wearing a pair of Tillyer Lenses. No paring is needed here for Tillyer Lenses are marginally corrected for both power and astigmatism. Only lenses, made as Tillyers are made, can give their accurate, comfortable vision — *to the very edge*. Tillyer Lenses are also available in Cruxite.

You'd prescribe
TILLYERS



A M E R I C A N O P T I C A L C O M P A N Y

AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

Original Papers	Page
A new operation for chronic glaucoma. Otto Barkan	951
An investigation of the angular relation of the visual (visierlinie) and optic (corneal) axes of the eye. George E. Park	967
Observations on the reducing substances (glucose) of the aqueous and vitreous humors of the eye. William M. James and A. J. Siefker	975
Keratoconjunctivitis with adenitis in Calcutta. Saradindu Sanyal ...	982
Orthoptic treatment of strabismus. J. L. Bressler	989
Visual tasks in sight-saving classes. Matthew Luckiesh and Frank K. Moss	992
Failures and successes in the operative treatment of detachment of the retina. Thomas D. Allen	1000
Notes, Cases, Instruments	
A one-meter perimeter. Alfred Cowan	1005
A technique for intracapsular extraction of cataract. Daniel B. Kirby	1006
Unusual cataract complication forty years after operation. Virgil J. Schwartz	1006
Epidemic keratoconjunctivitis diversiformis. H. G. Merrill	1007
Society Proceedings	
Minnesota, Los Angeles, London, Chicago, Colorado	1009
Editorials	
Nerve strains of vision; The reticulo-endothelial system; The New York meeting of the American Academy of Ophthalmology and Otolaryngology	1018
Book Notices	1022
Obituary	1025
Correspondence	1025
Abstract Department	1027
News Items	1051

For complete table of contents see advertising page V

Copyright, 1936, Ophthalmic Publishing Company, 640 South Kingshighway, Saint Louis, Missouri

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars.

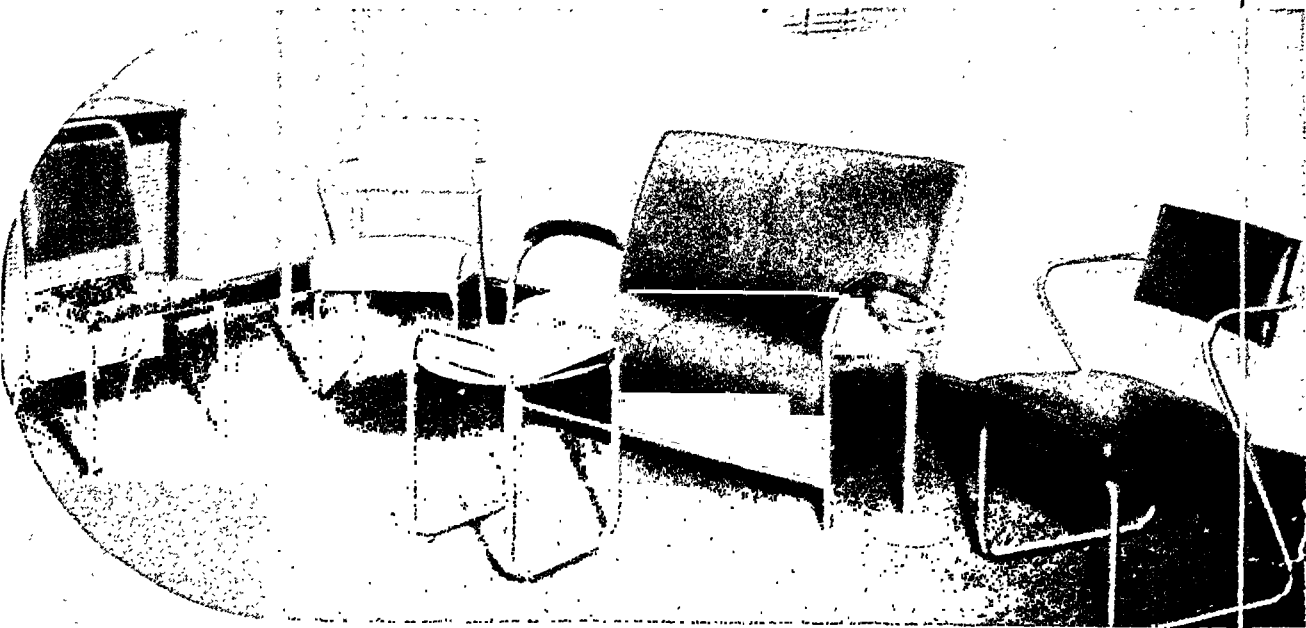
Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company, 640 S. Kingshighway, Saint Louis, Missouri

Editorial Office: 640 S. Kingshighway, Saint Louis, Missouri

Entered as second class matter at the post office at Menasha, Wisconsin

Now

YOU CAN COMPLETELY REFURNISH
YOUR RECEPTION ROOM WITH FINEST CHROMIUM FOR ONLY



\$98.75

Picture your reception room with modern chromium furniture. Imagine the ease and contentment of your patients as they wait for you in comfort amid pleasant modern surroundings. Realize how the smart appearance and cleanliness of chromium furniture impresses them. Think of the self satisfaction that comes from being marked as a progressive practitioner. Think how much all these things can mean to you—

Troy Furniture Is the Finest Chromium You Can Buy—The Troy Sunshade Company of Troy, Ohio, recognized leaders in Chromium furniture design and manufacture, make Troy Streamline Metal from the finest materials to the most exact specifications. It will give long, practical service and its smart styling is modern in good taste.

and then act. Send for your copy of Riggs' Troy Chromium catalog. In it you find a complete line of well designed, smartly styled furniture—at reasonable prices. For example—the attractive ensemble pictured above costs only \$98.75—payable over 20 months on a Riggs' convenient payment plan. Today, one can't afford to be old fashioned. Go modern in good taste with Riggs' Troy Streamline metal.

Only Riggs Offers This Service That Assures Beauty and Refinement. When desired, Riggs Decorating Service will suggest a complete color treatment for walls, floors and ceilings, to blend with the shades of upholstery selected for the streamline furniture. This assures you of proper color blending—a most important factor.

RIGGS OPTICAL COMPANY

General Offices • Merchandise Mart • Chicago, Illinois

Eyes That Seem To See

There is a double tragedy in the loss of an eye—

First is the loss of vision.

Second is the facial disfigurement.

The vision cannot, of course, be restored. But we can supply a properly fitted prosthesis that overcomes disfigurement.

Thousands of eye surgeons testify to the satisfaction of their patients who have been fitted in one of our many offices.

Naturalness in the final appearance requires years of experience in fitting and making artificial eyes. And we offer 85 years of exclusive service to this field.

Your patients will be given the service you have a right to demand for them from this nationwide organization.

COLOR CHART and SIZE GUIDE

This valuable aid to Eye Physicians doing their own artificial eye fitting will be sent *gratis*. Address nearest office.



MAGER & GOUGELMANN, INC.

Western Division

CHICAGO
30 N. Michigan Ave.
CLEVELAND
913 Schofield Bldg.

DETROIT
805 Empire Bldg.
PITTSBURGH
803 May Bldg.

MILWAUKEE
710 N. Plankinton Ave.
ST. LOUIS
801 Metropolitan Bldg.

KANSAS CITY
1105 Rialto Bldg.
MINNEAPOLIS
325 Medical Arts Bldg.

Eastern Division

NEW YORK
510 Madison Ave.

PHILADELPHIA
1930 Chestnut St.

BOSTON
230 Boylston St.

WASHINGTON, D.C.
207 Albee Bldg.

Join



American Red Cross

ARTIFICIAL EYES

TRUE TO LIFE



Fitted with Reform Eye shortly after operation
Remarkable motion, no noticeable depression

LIFELIKE ARTIFICIAL EYES that match with wondrous fidelity the human eyes they companion. All the wealth of MODERN SCIENCE, plus the skill of our artisans who have spent a lifetime at their art . . . is at your service here. Leading Ophthalmologists have looked to us for a generation . . . for fit, comfort and enduring satisfaction, as well as PERFECT RESEMBLANCE.

SELECTIONS ON APPROVAL

For Ophthalmologists who prefer to do their own fitting from our large and complete stock of Blended Iris Reform and Shell Eyes.

EYES MADE TO ORDER

Exact Duplication Assured

Gold and Glass Spheres Carried in Stock

Our Experts Make Regular Visits to Principal Cities

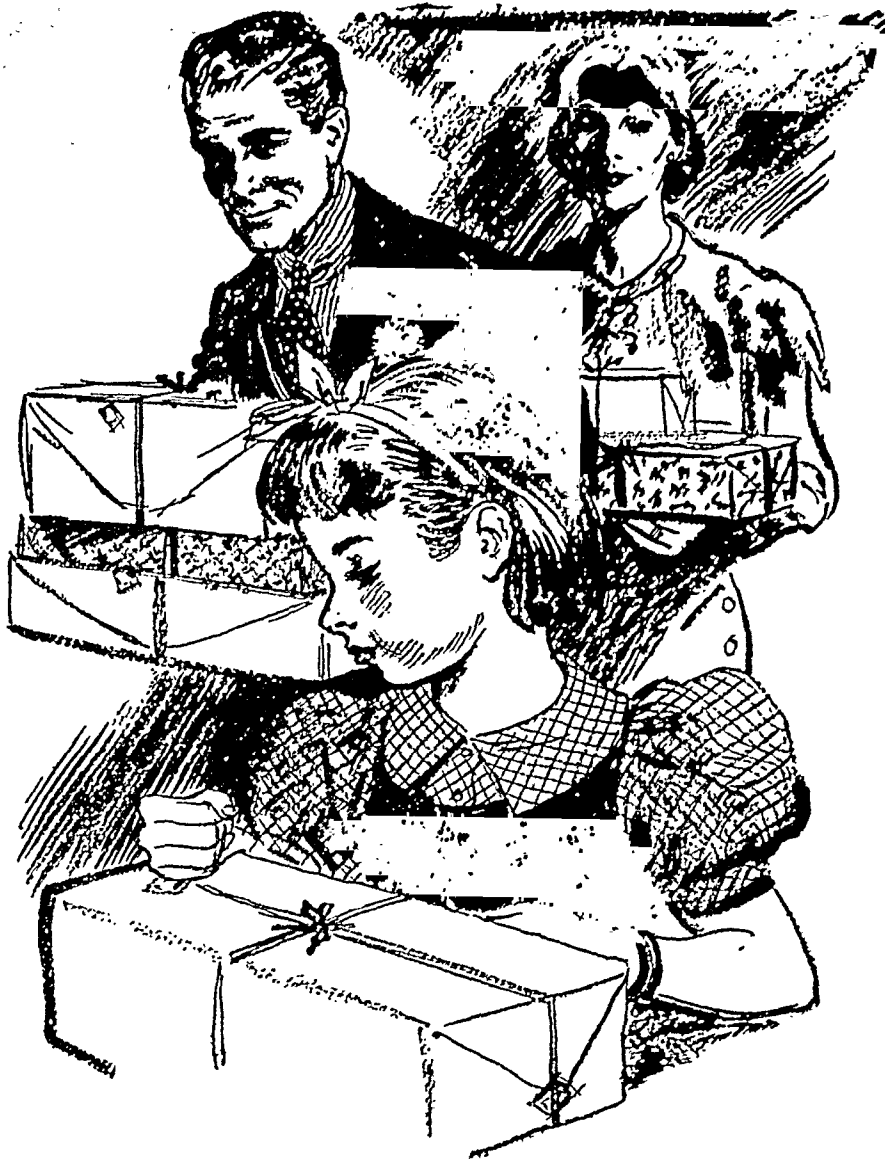
FRIED & KOHLER, INC.

Specialists in Artificial Human Eyes Exclusively

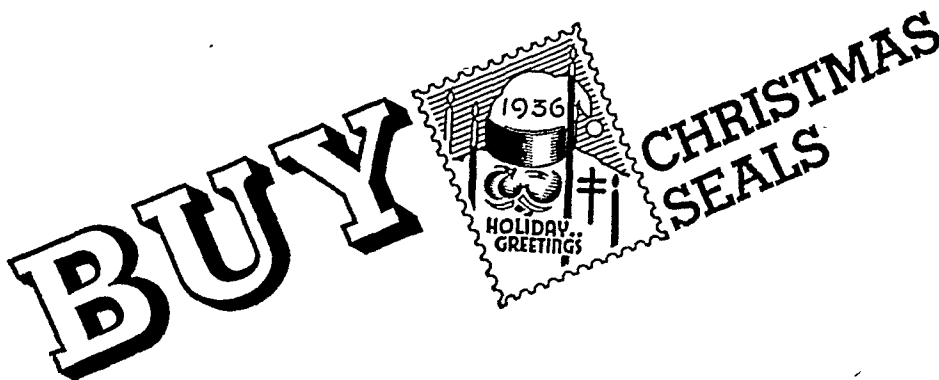
665-5th Ave. near 53rd St.

New York City, N. Y.

"Over thirty-nine years devoted to pleasing particular people"



THE CHILD'S HEALTH TODAY
IS THE NATION'S HEALTH TOMORROW



THE NATIONAL, STATE AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES

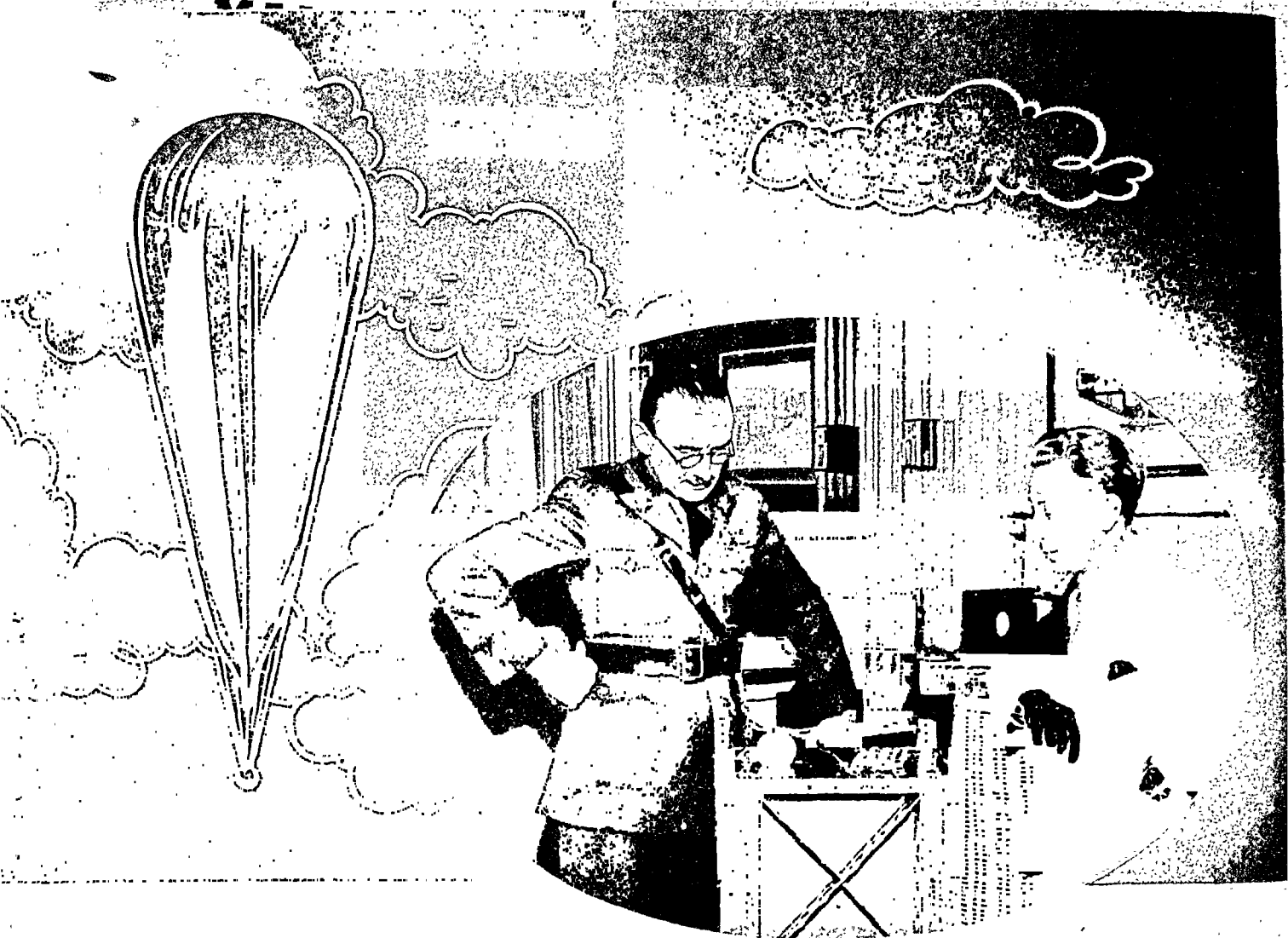
AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3, Vol. 19, No. 11

NOVEMBER, 1936

CONTENTS

Original Papers	Page
A new operation for chronic glaucoma. Otto Barkan	951
An investigation of the angular relation of the visual (visierlinie) and optic (corneal) axes of the eye. George E. Park	967
Observations on the reducing substances (glucose) of the aqueous and vitreous humors of the eye. William M. James and A. J. Siefker	975
Keratoconjunctivitis with adenitis in Calcutta. Saradindu Sanyal	982
Orthoptic treatment of strabismus. J. L. Bressler	989
Visual tasks in sight-saving classes. Matthew Luckiesh and Frank K. Moss ..	992
Failures and successes in the operative treatment of detachment of the retina. Thomas D. Allen	1000
Notes, Cases, Instruments	
A one-meter perimeter. Alfred Cowan	1005
A technique for intracapsular extraction of cataract. Daniel B. Kirby	1006
Unusual cataract complication forty years after operation. Virgil J. Schwartz ..	1006
Epidemic keratoconjunctivitis diversiformis. H. G. Merrill	1007
Society Proceedings	
Minnesota Academy of Ophthalmology and Otolaryngology. Section on Ophthalmology, January 10, 1936	1009
Los Angeles Society of Ophthalmology and Otolaryngology, February 18, 1936	1009
Royal Society of Medicine, London, Section of Ophthalmology, February 14, 1936	1010
Chicago Ophthalmological Society, February 17, 1936	1014
Colorado Ophthalmological Society, February 15, 1936	1017
Editorials	
Nerve strains of vision	1018
The reticulo-endothelial system	1019
The New York meeting of the American Academy of Ophthalmology and Otolaryngology	1021
Book Notices	
The eye and its diseases	1022
Awerbach jubilee volume	1024
Lecciones de oftalmologia clinica especial	1024
Obituary	
Claud A. Worth	1025
Correspondence	
The International College of Surgeons	1025
Abstract Department	
Uveal tract, sympathetic disease, and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus; Tumors; Injuries; Systemic diseases and parasites; Hygiene, sociology, education, and history; Anatomy, embryology, and comparative ophthalmology	1027
News Items	1051



Measuring Ultra Violet Radiation *in the Stratosphere*

When the U. S. Army-National Geographic Society balloon went aloft from the Black Hills last October, an important item of its scientific equipment was a specially built Bausch & Lomb Spectrograph, designed to measure the absorption of ultra violet light in the higher levels. Recordings made 73,000 feet above the earth's surface are now being studied.

Day by day Bausch & Lomb optical equipment is contributing in man's search for knowledge. These contributions are made in many fields of science and industry, but none is more important than in the correction of defective eyesight. In the Orthogon lens, ethical practitioners have found the most nearly perfect aid to vision yet devised.

In Soft-Lite, too

BAUSCH & LOMB

Orthogons

A NEW OPERATION FOR CHRONIC GLAUCOMA

Restoration of physiological function by opening Schlemm's canal
under direct magnified vision

OTTO BARKAN, M.D.
SAN FRANCISCO

It is suggested that this operation solves the surgical problem in the majority of cases of chronic glaucoma. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber is in full view and magnified during the operation. The surgeon can see the area of blockage, which is the cause of the glaucoma, and guide his instrument in restoring the normal outlet for the intraocular fluid. The results are predictable and appear to be permanent, the longest period of observation to date being one of 11 months. The operation is without danger when the proper technique is used and has proved successful in the writer's hands when the necessary preoperative indications (binocular microgonioscopic diagnosis) have been fulfilled. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936. Demonstrated before the Section of Ophthalmology of the American Medical Association at Kansas City, Missouri, May 14, 1936.

History of present-day glaucoma operations

The successful surgical treatment of glaucoma was originated by Von Graefe in 1857, when he first performed iridectomy. This operation has withstood the test of time in cases of acute glaucoma and to a lesser degree in those of the chronic congestive form. However, for noncongestive and chronic simple glaucoma it has more often proved valueless and indeed harmful except in those cases of imperfect healing which happened to result in a filtering scar. Such accidentally filtering scars led, in the course of time, to the development of the purposeful filtration type of operation. It was not, however, until 1903, when the subject of fistula formation was again brought up by Herbert, that major advances were made by Holth (iridencleisis, 1906), Borthen (iridotaxis, 1909), Schloesser (sclerotomy with iris inclusion, which he practiced as early as 1904), Lagrange (iridosclerectomy, 1905), and Elliot, who in 1909 was the first to systematize and perform in large numbers the trephining operation. These external filtering operations, with their promise of saving sight, were received with great interest

and enthusiasm 30 years ago at a time when many patients with chronic glaucoma were going blind because of the inefficacy of treatment with miotics or iridectomy. After the first period of enthusiasm, critics and antagonists of the filtering operations appeared in increasing numbers. It became apparent that not only were the operations frequently unsuccessful in reducing tension, but also that in not a few of the successful cases cataracts later developed, or pupillary membranes. Other eyes were lost through late infection and some even developed sympathetic ophthalmia. It was at this time that Heine¹ published his operation of cyclodialysis, which was intended to establish internal drainage and to avoid the dangers of the external filtering operations. Cyclodialysis is, however, also far from satisfactory, inasmuch as its action is sometimes insufficient and the operation must, therefore, be repeated. Occasionally it is excessive, causing hypotony with consequent formation of a cataract, or acceleration of an incipient one in the course of the following years. Other operative procedures, among which Curran's iridotomy² should be mentioned, have been tried but not widely accepted.

Critical survey of glaucoma operations, past and present

It is evident, then, that both external filtering operations and cyclodialysis (internal filtering) are uncertain in reducing increased intraocular pressure and that when successful in reducing pressure they are not infrequently followed in the course of years by other serious complications. These operations with their immediate and late dangers are practically the only ones in use today for chronic primary noncongestive glaucoma. The ophthalmic surgeon is duly grateful to them for saving eyes which would have been doomed to blindness only 30 years ago. Yet he cannot feel satisfied so long as these operations are uncertain in both their immediate and late results, and are attended with considerable hazards in the hands of the best operators.

Ever since it was found that Graefe's "iridectomy" with its incision near the angle of the anterior chamber was successful in relieving intraocular pressure, a large and varied number of surgical procedures have been applied empirically to the region of the angle in the hope that they, also, might reduce pressure. These attempts were so varied and numerous that it has been said that for a glaucoma operation to be effective, one merely had to do "something somewhere in the region of the angle." The possible role of an hypothetic sclerosis of the sclerocorneal trabeculum as a cause of chronic glaucoma was suggested by some workers (Henderson,¹⁸ Levinsohn,¹⁹ and Schieck,²⁰ among others), but no surgical inferences were drawn. The question of whether the beneficial action of some operations for glaucoma, such as iridectomy or anterior sclerotomy, might be due to the severance of the trabeculae, has up to the present remained a matter of pure conjecture. Such anatomic evidence as was available argued against the idea, for Priestley Smith²¹ found the incision of iridectomy to have passed completely anterior to the trabeculae in all enucleated eyes examined by him. De Wecker²² felt that when it reduced pressure his anterior sclerotomy did so through the formation of a cystoid scar

in the sclera and that its pressure-reducing effect was in no relation to the trabeculae or to Schlemm's canal. De Vincentiis²³ in 1892 reported his operation of "incision of the iridic angle," and tried it in many varieties of glaucoma, reporting some excellent results. Valude and Duclos²⁴ spoke of it as a "débridement" of the angle; both apparently labored under the impression that peripheral adhesions of the iris or other tissues that were blocking the filtration angle had to be removed. The polemic which arose between De Vincentiis and De Wecker on the subject of "internal sclerotomy" proves, in the light of recent observations, how deficient was their interpretation of the action of their respective procedures. It would seem that this procedure has almost without exception fallen into disuse. Czermak,²⁵ Meller,²⁶ and others described De Vincentiis's operation in their textbooks. Czermak pointed out that he has had no personal experience with it. Meller* stated that E. Fuchs occasionally used it in hydrophthalmus to avoid the dangers of iridectomy. In his textbook, Meller's indications for the operation are given as hydrophthalmus, and hemorrhagic and occasionally cyclitic glaucoma. Except for the reports of Scalinci,²⁷ in 1900, on the results of the incision of the tissue of the iridic angle in hydrophthalmus and, in 1902, on the anatomical findings in two eyes which were experimentally operated upon in this manner before being enucleated for other reasons, I have found no mention of it in the literature since that date. To the best of my knowledge and judging by the absence of references, it has not been practiced by anyone, with the just-mentioned exceptions, for many years.

Recent special investigations

Present-day operations for glaucoma are unsatisfactory according to any surgical standard. It was for this reason that the writer began some years ago to investigate the causes of glaucoma. The results of these investigations have recently been published.^{3, 4, 5}

* Personal communication.

An apparatus consisting of a binocular microscope suspended from the ceiling by means of a semirigid and flexible arrangement was devised. With excellent illumination from a Vogt carbon slitlamp and with the use of the Koeppe eye-adhesion glass (contact glass for investigations of the angle of the anterior chamber), it was possible to do slitlamp biomicroscopy of the angle of

ology and anatomy of the region was, therefore, first attacked.³ On further investigation it proved possible to recognize and study the details of the sclerocorneal trabeculum and sometimes to see the inner wall of Schlemm's canal throughout its circumference. Such clarity and detail of this view was impossible to obtain with any of the former methods.

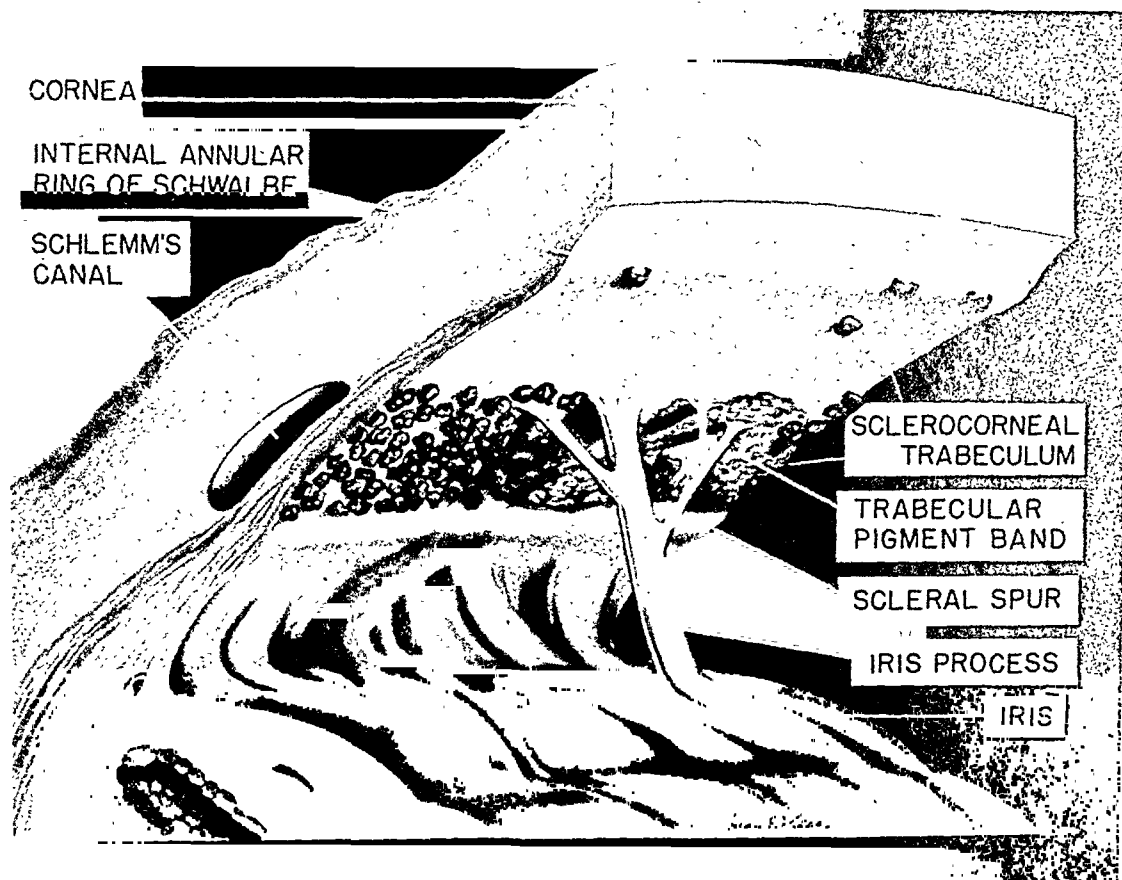


Fig. 1 (Otto Barkan). Chronic noncongestive glaucoma type 1. Schematic drawing showing open angle of the anterior chamber and blockage of the sclerocorneal trabeculum.

the anterior chamber with perfect ease. A study of the literature on the subject of the angle of the anterior chamber and its examination in the living (gonioscopy), as revealed in the excellent pioneer work of Salzmann,⁶ Trantas,⁷ Troncoso,⁸ Koeppe,¹⁰ Thorburn,¹¹ Werner,¹² Ascher,¹³ Bruce,¹⁴ Castroviejo,¹⁵ among others, showed that not a little confusion in terminology existed and that sometimes drawings and plates were misleading. The problem of identifying landmarks with the improved technique and of interpreting the physi-

Such elaborate apparatus is not necessary for quick orientation in the course of clinical examination. For this purpose it is sufficient to use a hand lens or a head loupe instead of the binocular microscope. A hand slitlamp or other form of light held in the hand may suffice for focal illumination.

The depth of the angle of the anterior chamber

During the investigations in which the mode of action of cyclodialysis⁵ and other operations was studied, the depth

of the anterior chamber was routinely measured. This was done with a vernier or movable scale attached to the binocular microscope. It is an accessory that does not in the least encumber the slitlamp-microscope unit and is always at hand for anterior-chamber readings. The readings have been found clinically reliable when a standard was used

chronic primary glaucoma is due to obstruction of outflow of aqueous from the anterior chamber into Schlemm's canal. This obstruction is located in the sclerocorneal trabeculum. When this normally pervious septum, which separates the lumen of Schlemm's canal from the anterior chamber, becomes impervious or sclerosed, increased pres-

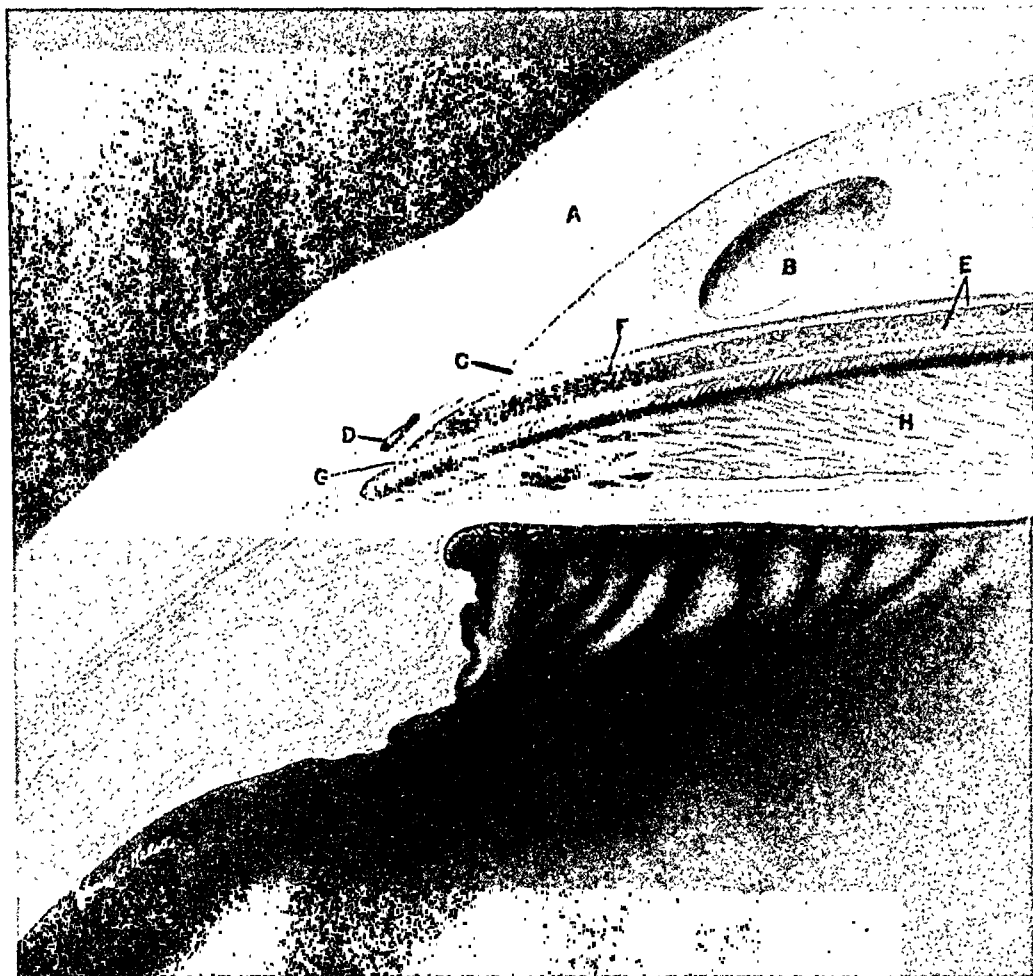


Fig. 2 (Otto Barkan). The effect of a trephining operation. A, cornea; B, trephine; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, Sclerocorneal trabeculum; F, trabecular pigment band; G, scleral spur; H, iris.

based on many observations in normal eyes.

The cause of increased intraocular pressure in chronic primary glaucoma (and in some cases of chronic secondary glaucoma)

The writer has recently maintained⁴ and is now able to prove that the increased intraocular pressure in over one half of all cases of noncongestive

sure results through retention of aqueous. The amount of increase may vary anywhere from slightly above normal to the highest degree of hypertension. This type of glaucoma is, as will be shown below, a true "retention" glaucoma just as increased intracranial pressure may be due to retention of spinal fluid (hydrocephalus) caused by a block of outflow in the leptomeninges or in the ventricular system. In these cases

of retention glaucoma, corneoscleral trephining and all other external filtering operations, as well as cyclodialysis (which may be regarded as an internal trephining) are, like a decompression operation (or trephining) of the skull, purely palliative. They are a confession of inability to remove the actual cause of the increased pressure.

sclerosis, with or without deposition of pigment. There is usually present, however, a dark band of pigment granules whose position corresponds exactly to that part of the trabeculum which covers Schlemm's canal. The trabeculum has become impervious. As the pores between the trabeculae are diminished in size they become plugged with pig-

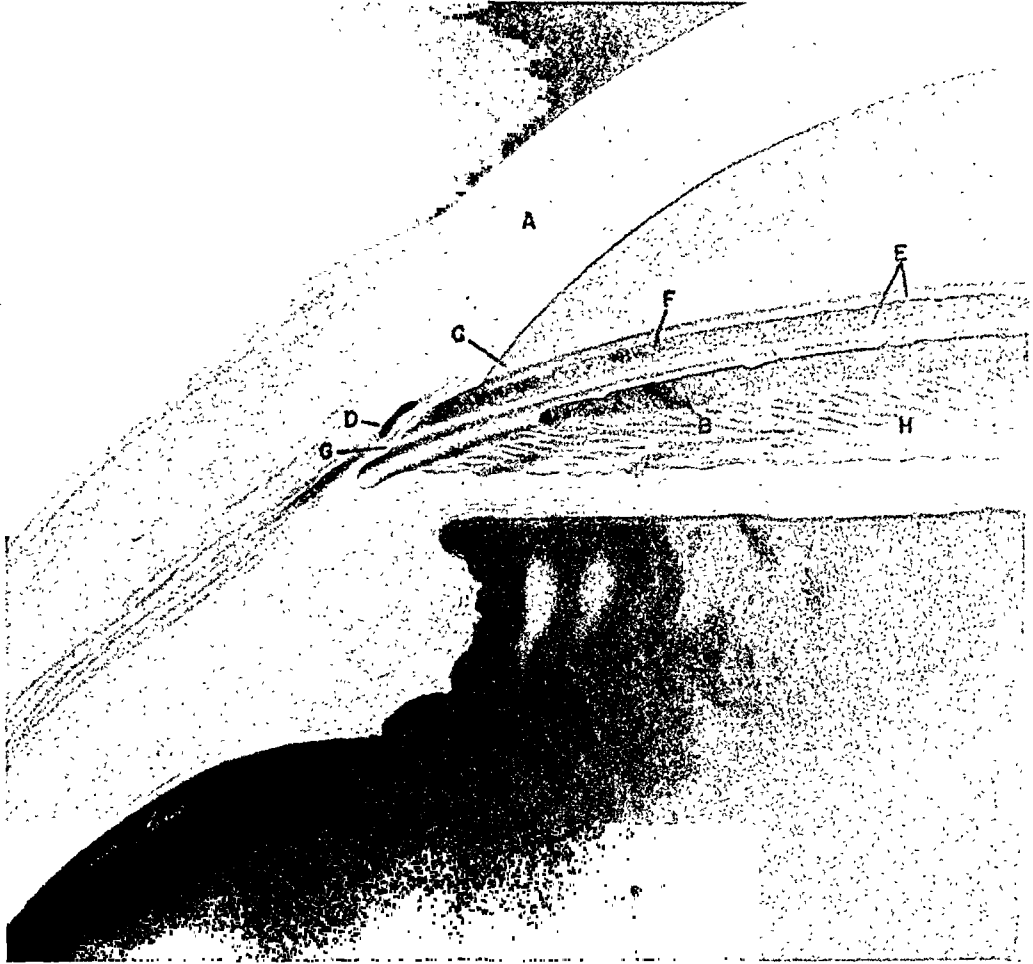


Fig. 3 (Otto Barkan). The effect of cyclodialysis. A, cornea; B, cleft showing communication between anterior chamber and suprachoroidal space; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; F, trabecular pigment band; G, scleral spur; H, iris.

It was further found that chronic glaucoma may be divided into two great types:

Type 1: The majority of chronic-non-congestive-glaucoma cases belong to this type. It shows an open angle and absence of peripheral adhesions of the iris to the wall (figs. 1, 2, 3). The anterior-chamber depth is normal or only slightly reduced. The inner wall of Schlemm's canal (trabeculum) shows

ment granules, a conglomeration of which then becomes apparent as the dark band just mentioned. There seems also to be an excessive exfoliation of iris pigment. This type is true retention glaucoma due to a "sclerosis" or thickening of the trabeculum separating Schlemm's canal from the anterior chamber, and to a plugging of its pores with pigment. Since the angle is open and access to the wall of Schlemm's

canal is free, it is apparent that miotics reduce tension in this type of glaucoma through neurogenic or vascular action rather than mechanically by changing the configuration of the angle. Mild mydriatics may, therefore, be used with safety, in this type.

Werner¹² found that 79 percent of all chronic or simple noncongestive cases

of increased intraocular pressure and of whether the process began primarily as a narrowing of the pores or as a blocking of them with particulate matter. The latter is probably the case in Vogt's Glaucoma chronicum capsulo-lenticulare (exfoliation of the lens capsule). Here I have found capsular shreds on Descemet's membrane, and in the an-

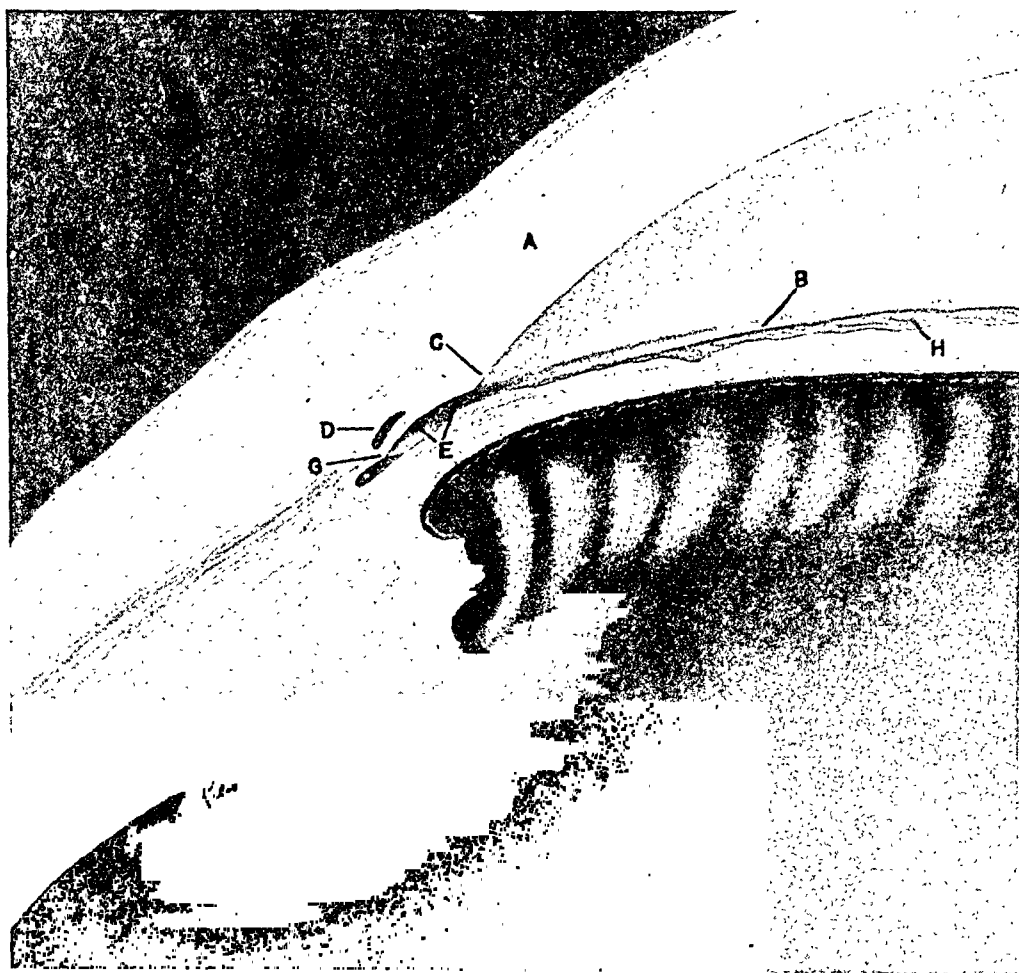


Fig. 4 (Otto Barkan). The anterior-chamber angle in chronic noncongestive glaucoma type 2. A, cornea; B, narrow slitlike entrance to the angle. C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; G, scleral spur; H, iris, anterior surface.

showed an open angle upon gonioscopic examination; Thorburn¹¹ 75 percent; Troncoso⁹ 55 percent. My own clinical experience corresponds to these findings and I feel that 60 percent, and probably even a greater percentage of noncongestive-chronic-glaucoma cases, show an open angle and therefore belong to this great type 1.

In this type are included all open-angle cases irrespective of the amount

gle, where they have drifted and become adherent to the trabecular wall. They occasionally hang from it like minute stalactites. The dark pigment band is also present in these cases. It is apparent that one is here entering a transition zone of cases which it has been customary, up to the present, to divide sharply into the two categories of primary and secondary glaucoma, according to whether or not recognizable

changes of other disease were present. The writer's classification depends upon approaching the problem from the mechanical, physiological, and surgical points of view, for this would seem at the present time to give the greatest promise of solving the clinical problem of glaucoma.

Type 2: This type shows a shallow anterior chamber due to advance of the iris-lens diaphragm and ballooning of the iris (fig. 4). Biomicroscopic examination (microgonioscopy) shows the entrance of the angle to be narrowed to such a degree that only a moderate dilation of the pupil, as, for instance, through mild mydriatics or psychogenic causes, would result in its closure by the root of the iris with consequent increase in intraocular pressure. Miotics keep the entrance of the angle open. The action of miotics in this second type is, therefore, largely mechanical in that they prevent blockage of the entrance to the angle by pulling the iris away from it.

It is not within the scope of this paper to enter into the possible relationship of these two types of glaucoma, the one to the other. This has been touched upon in another article.⁴ Suffice it to say that it is highly important to separate them from one another, both clinically and surgically.

Role of the trabeculum in present-day glaucoma operations

Biomicroscopy (or binocular microgonioscopy) of successfully cyclodialyzed eyes shows that the success of this operation is due to the formation of a communication between the anterior chamber and the suprachoroidal space, as was Heine's original intention.^{*, 5, 16, 17} The newly created channel for filtration between the anterior chamber and the

suprachoroidal space passes posterior to Schlemm's canal and leaves the trabeculum or inner wall of the canal untouched (fig. 3). In the successful trephine operation (fig. 2) the trabeculum is likewise left untouched, since the opening is always placed anterior to the trabeculum, as it also is in iridencleisis and other external filtering operations.

It is quite apparent then that the obstruction which is the actual cause of the increased intraocular pressure in chronic noncongestive glaucoma type 1 (simplex), namely, the impervious trabeculum, is not touched by any of the present-day operations for glaucoma.

It is furthermore evident that this statement also holds true for that form of congestive glaucoma which is the late or decompensated stage of the simple or noncongestive type 1. This decompensated or congestive stage is associated with the development of peripheral adhesions of the iris which in themselves constitute an additional block to the outflow of aqueous; the adhesions probably also cause kinking of the iris with resultant obstruction of venous outflow and increased transudation.

Conclusions on the mechanical etiology of chronic glaucoma confirmed by incising the trabeculum and opening Schlemm's canal

As the trabeculum, which is so readily visible with the biomicroscopic technique to be described later, and in which it seemed certain was situated the actual block to the outflow of aqueous, is left untouched by all types of operations in use today for chronic noncongestive glaucoma, it occurred to me to divide the obstructing trabeculum by incising it from within the eyeball, thereby reopening the natural channels for aqueous outflow. In other words, instead of making an artificial drain or channel for the outflow of aqueous to the exterior (trephining and other external filtering operations) or an artificial one to the interior (cyclodialysis) it seemed better in every way to *restore the physiological pathway from the anterior chamber into Schlemm's canal by means of an incision of the obstructing trabeculum or septum which sepa-*

* The author has recently come into possession of an eye successfully operated on by cyclodialysis, this being the only other specimen of its kind since the unique one reported by Elschnig. The results of microscopic examination of it, which will be published in the near future, offer further evidence in support of the view that the action of cyclodialysis is due to internal drainage into the suprachoroidal space.

rates the two (fig. 5). This operation was performed in ten cases reported below and was completely successful in every case where it was indicated, but one.*

The first seven patients were operated upon with the technique of De Vincentiis, before the surgical contact glass and the method of operating under direct vision had been devised. After making the puncture in the temporal limbus the knife traversed the chamber until its blade disappeared from view behind the nasal limbus. The blade of the knife was inserted in the angle wall $1\frac{1}{2}$ to 2 mm. posterior to the limbal margin as judged on the outer side of the eyeball and was slowly swept around the lower and inner circumference of the limbus. Neither the blade nor the contents of the angle of the anterior chamber were visible to the surgeon during the operation. He was, actually, operating blindly or semi-blindly. Consequently, the blade might cut into the ciliary body (it could easily slip behind the scleral spur and cause a major hemorrhage) or arrive in the cornea where it would be ineffective. One must recall that the angle is but one millimeter in breadth by actual measurement; for surgical purposes it is even less, inasmuch as its plane is quite oblique to the plane of the knife and much foreshortened in relation to the surgeon. As the incision was hidden underneath the opaque limbus, it would seem a priori hardly feasible to place it correctly in a majority of cases. Yet, surprisingly enough, postoperative biomicroscopy showed this to have occurred in all but one case (six out of seven) in which the operation was done by this method. In all but one Schlemm's canal was struck and opened over a sufficient extent to reduce pressure. In a few the knife went too far posteriorly during a small part of the incision and caused a detachment of the

iris root with moderate bleeding. This occurred in the one case mentioned above in which a marked hemorrhage into the anterior chamber took place. The increased pressure remained unchanged. Such complications are avoided with the new technique (about to be described) which enables the surgeon to operate under direct magnified vision.

Operation on Schlemm's canal under direct magnified vision

As the result of recent researches, the writer has developed a surgical contact glass which enables him to operate on Schlemm's canal with this region in full view. *The construction of the surgical contact glass** is such as to make it possible to fix the eyeball, to insert a specially designed knife and to guide its blade in the region of the wall of the angle while both blade and angle are under full view and magnification. That is, the obstructed inner wall of Schlemm's canal (the trabecular pigment band which the writer has proved to be the mechanical cause of the increased intraocular pressure) is incised under binocular and magnified direct vision. The physiologic and anatomic pathway for the outflow of aqueous from the anterior chamber into Schlemm's canal is thus restored.*

By means of this technique of operating under direct vision, a perfect placement of the incision is secured; the hazards of missing the canal by placing the incision too far anterior or posterior and thereby cutting into the ciliary body with resultant hemorrhage are almost completely eliminated.

Technique of operation. The eye is prepared in the usual way for intraocular surgery. The conjunctival sac is thoroughly cleansed of all secretion or material that might tend to render turbid the physiological saline solution that will be placed between the cornea and the contact glass. The glass must be scrupulously clean to insure perfect visibility. After heat sterilization, the glass is passed through alcohol and

*This eye (which had been trephined elsewhere without success two years previously) was operated on in the first series of seven cases, before the surgical contact glass and the method of operating under direct magnified vision had been developed. Three patients were operated upon with the latter technique, all successfully.

** This recently developed surgical contact glass is being further perfected at the present time and will be described in a separate article in the near future.

water. The eyelashes of the temporal third of both lids are clipped. Akinesis of the lids is induced by the Van Lint method. Local anesthesia is induced by the instillation of a 1-percent solution of pantocaine in the previously well-esterinized eye; lid sutures may be inserted or a blepharostat used to hold the lids apart. The surgical contact glass is applied and sterile physiological saline solution at body temperature is injected with a 1-c.c. Luer syringe and delicate curved canula under the temporal margin of the glass while the eye is rotated nasally.

During the operation the surgeon sits on a stool facing the patient's temple with his head a little higher than that of the patient. In this way he is in line with the patient's temporal limbus and also in a position to observe the angle of the anterior chamber through the contact glass. The assistants stand. With the contact glass alone a $\times 1\frac{1}{2}$ magnified picture of the angle is obtained. For the purpose of the operation it has been found most convenient to increase this magnification about $\times 2$, by means of a head loupe. The most suitable method of illumination has up to the present proved to be a hand slit-lamp held temporally and above for the right eye and temporally and below for the left, combined with a very strong overhead lamp that also serves slightly to transilluminate the angle wall from the nasal side.

The gaze of the patient is directed toward the ceiling. One assistant fixes the contact glass by pressing slightly on the depression in its convex surface with rod or probe. The glass is so placed as to expose the temporal limbus and the second assistant wipes its anterior surface with applicators in order to insure good visibility for the surgeon. The latter fixes the sclera with a small Elschmig forceps in his left hand. Iodine is applied to the limbus at the intended point of puncture. With his right hand he pierces the temporal limbus with a specially designed knife,* passes it across the chamber, and deliberately in-

serts it into the trabeculum which is under full view on the other side of the anterior chamber. The dark trabecular pigment band is sufficiently distinct to act as a guide. The incision is continued downwards and Schlemm's canal is thus opened through one fourth to one third of its extent, after which the knife is quickly withdrawn without loss of aqueous. The contact glass is then removed and monocular occlusion applied.

After the operation eserine is instilled for several days in order to keep the stromal surface of the iris from forming adhesions with the opening in Schlemm's canal. The patient suffers no pain nor discomfort and it is remarkable to note the normal appearance of the eye and the brilliant luster of the cornea the day after the operation.

Postoperative biomicroscopic examination of the angle

Postoperative biomicroscopic examination of the angle within a period of two or three weeks shows the obstructing trabeculum to have been divided throughout a varying part of its extent (fig. 5). In some cases, a wide rent is observed, in others a slitlike opening. As all eyes operated upon under the contact glass show the opening of Schlemm's canal in the absence of any other anatomic change, it seems evident that this is the sole reason for the normalization of the intraocular pressure. The operation leaves the outward appearance of the eye unchanged.

Permanence of results

One question remains to be answered—is the normalization of intraocular pressure permanent? The pressure has remained normalized in all cases in which Schlemm's canal was opened since the first operation of 10 months ago. The postoperative appearance of the opening of Schlemm's canal has remained unchanged. There seems to be, therefore, no tendency to scar formation or closure. This is, perhaps, what one would expect when one considers nature's tendency to maintain the physiological pathway in the case of secretory

* The knife may be procured from Mueller & Co.

or excretory ducts; as, for instance, in the case of fistulae of the salivary or common bile duct or of the ureter. The fistula closes as soon as the obstruction in the duct is relieved. The physiological pathway is preferred and maintained. One should also bear in mind the tendency of a longitudinal incision of a ves-

of years can conclusively answer this question. It is conceivable that the communication which the operation has established between the anterior chamber and Schlemm's canal might eventually close or that, in the absence of a normal trabeculum, one of whose physiological functions it is to act as a sieve,

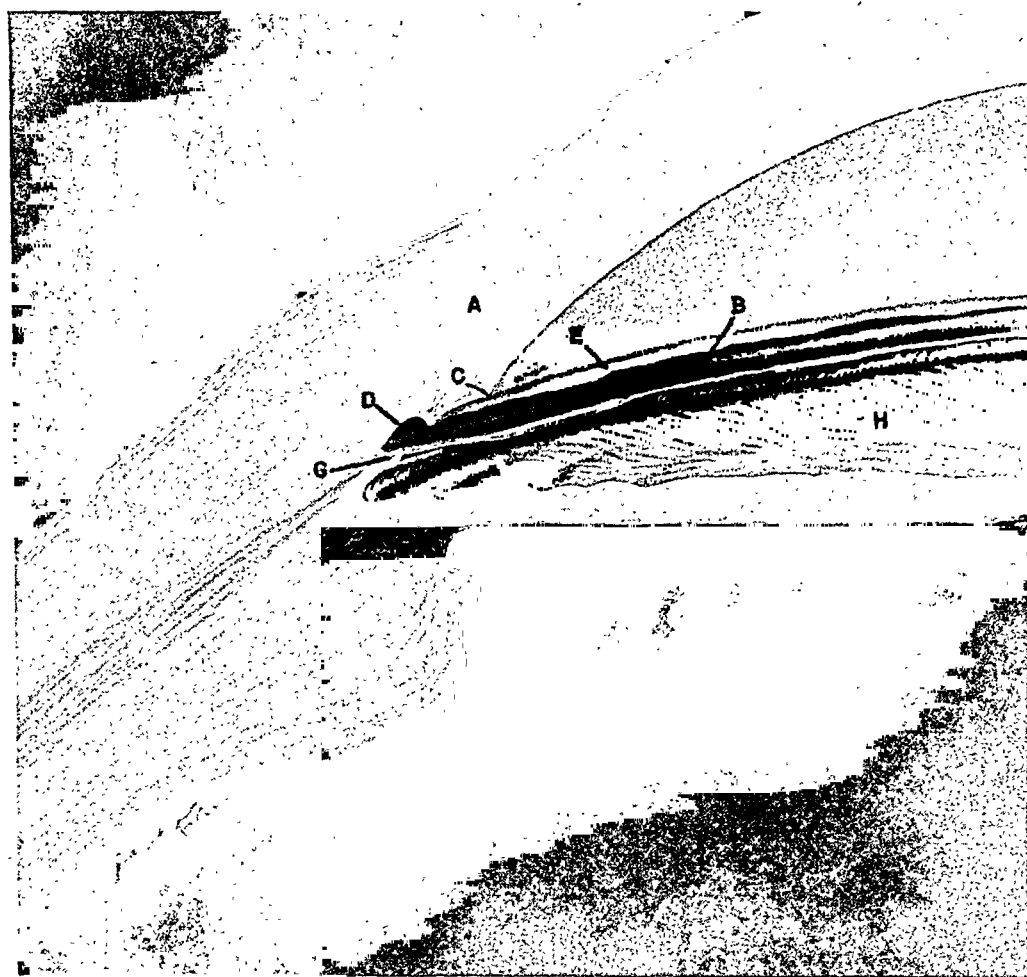


Fig. 5 (Otto Barkan). The effect of the author's operation: Incision of Schlemm's canal (goniotomy). A, cornea; B, opening of Schlemm's canal, restoration of physiological outlet; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; G, scleral spur; H, iris.

sel to gape; this would more especially obtain in the case of the elastic trabeculae and may be further encouraged by the pull of the ciliary muscle on the scleral spur. Perhaps also the aqueous may inhibit the formation of scar tissue.

Judging from analogy, there seems then to be no reason why the elimination of aqueous through the opening in Schlemm's canal should not continue permanently, as it has done during the past several months. Only the passage

particulate matter entering Schlemm's canal might block its emissaries (collector channels)²⁸ through which the aqueous is eliminated into the intrascleral venous plexus. Personal observations and clinical experience make this eventuality appear improbable. But if, for some unforeseen reason, the outflow through the surgically restored outlet should indeed become obstructed in the course of years, a second operation could with equal ease be performed

on another sector of the circumference of Schlemm's canal and no doubt with the same good result. It is interesting to recall in this connection the pathologic anatomic fact that the lumen of Schlemm's canal remains patent into the last stages of absolute glaucoma. This fact is confirmed by my investigations and is shown to have the greatest surgical significance. In other words, the block of the outflow of aqueous is situated in the wall of Schlemm's canal and not in the canal itself. Hence, the possibility of reestablishing outflow and normalizing intraocular pressure remains even in the latest stages of glaucoma.

The further scope and other advantages of the new operation under the surgical contact glass will be dealt with in another article. May it suffice merely to mention here that in many cases, judging by present experience, the continued use of miotics will prove unnecessary; that the operation is equally successful in certain cases of secondary glaucoma, which are in part or wholly due to sclerosis or blocking of the trabeculum; and that its lack of hazard is particularly gratifying in late cases of unilateral glaucoma.

Case reports

Case 1. Mr. W. M. M., aged 55 years, was seen August 9, 1935. For six months he had had occasional foggy vision and haloes. Vision was R.E. 1.0 and J 1; L.E. fingers at 3 feet. The depth of the anterior chamber measured 1.7 mm. The fundi showed a glaucomatous excavation of the optic discs in both eyes, in the left greater than in the right. Tension (McLean) of the right eye was 38 mm. Hg, of the left 50 under 1-percent pilocarpine (every three hours).

Microgonioscopy showed chronic glaucoma, type 1.

Operation August 13, 1935, on the left eye, was an incision of Schlemm's canal (goniotomy) without the surgical contact glass. Next morning the tension was 18, the cornea brilliant, and the eye comfortable.

Postoperative microgonioscopy on October 19th, showed Schlemm's canal opened between the 4:00- and 6:30-o'clock position. Within this area were two adhesions of iris stroma to the wound lips of Schlemm's canal. Thus only a small portion of the total circumference of the canal was in communication with the anterior chamber. Peripheral adhesions of iris must have been the result of loss of aqueous during the operation when

the stroma of the iris came into contact with the incision of Schlemm's canal and remained adherent to it, for in no other case after this first one did such peripheral adhesions occur. On November 25th, tension in the right eye was 40, in the left eye 30 mm. Hg. The last drop of pilocarpine had been given two hours before. The visual field in the left eye had improved and vision increased to 1/10 eccentric and J 7. On May 1, 1936, tension in the right eye was 45, in the left eye 30 mm. Hg (under pilocarpine).

Summary: A small incision of Schlemm's canal in the left eye reduced the tension from 50 to 30 mm. (both readings under pilocarpine). Last observation was made 10 months after operation. (Hemorrhage and loss of anterior chamber did not occur in later cases in which the operation was conducted under the surgical contact glass.)

Case 2. Mr. E. L. W., aged 49 years, presented himself in January, 1936, nervous and apprehensive, complaining of a subjectively enlarged blind spot in the left eye and of other subjective symptoms. Tension in the right eye was 22, left eye 30 mm. Excavation of the left optic disc was marginal through one half of its circumference. After the administration of 1/8-percent pilocarpine, the tension was right eye 25, left eye 26 mm. The visual field of the left eye showed a Bjerrum scotoma approaching the point of fixation.

Microgonioscopy showed the angle of the anterior chamber to be normal in the right eye, whereas the left eye showed a pronounced dark pigment band over Schlemm's canal; the angle was open. The left eye, therefore, belonged to chronic glaucoma, type 1. The need of regular instillation of miotics was explained. The patient, who was of a high order of intelligence but nervously unstable, refused to consider using miotics for the rest of his life and demanded an operation such as would relieve the pressure without undue hazard.

Operation. On January 26, 1936, an incision was made in Schlemm's canal (goniotomy) of the left eye extending through one third of its circumference. The tension before operation was right eye 25, left eye 28 (both eyes under pilocarpine). Two days after the operation the tension in the right eye was 28, in the left eye 5 mm. (without pilocarpine). On January 30th the tension in the right eye was 20, in the left eye 10; on February 10th, tension R.E. 25, L.E. 11; on February 14th, tension R.E. 24, L.E. 15; on April 20th, tension R.E. 22, L.E. 20 mm. (without pilocarpine).

Postoperative microgonioscopy after three months showed Schlemm's canal to be opened from the 4:30- to the 8:00-o'clock position.

Summary: Tension in the left eye was reduced to within the limits of what is normal for this patient; progressive loss of function, which had been definite before operation, has been arrested during a period of observation of four months after operation, without the use of drops.

Case 3. Mr. G. L., aged 68 years, had a bilateral chronic noncongestive glaucoma. In 1924, iridectomy in the right eye normalized tension to 38 mm. Hg (McLean). Tension in the left eye was 52 under 1-percent pilocarpine. Vision in the right eye was ability to count fingers, in the left eye 1.0 and J 1. In 1925, iridencleisis in the left eye reduced tension to 20 mm. In January, 1935, tension was right eye 30, left eye 25. During 1935 tension in the right eye increased to 50 mm. in spite of miotics and there was a gradual loss of visual field.

Microgonioscopy showed a chronic glaucoma, type 1.

Operation on the right eye, October 22, 1935, was an incision of Schlemm's canal (goniotomy). On May 1, 1936, tension in the right eye was 27, in the left eye 25 mm. Hg.

Summary: Tension in the left eye of 50 mm. Hg was reduced to 25; the period of observation was six months.

Case 4. Mrs. N. N., aged 62 years, presented herself on October 30, 1933, giving a history of gradual loss of vision in the right eye during the last 9 years, and in the left eye increasingly foggy vision for 8 years. Vision in the right eye was amaurosis, in the left eye 0.3 and J 5. Tension under 2-percent pilocarpine was R. 75, L. 50 mm.; there was a Bjerrum scotoma; and the optic discs showed glaucomatous excavation with atrophy.

Microgonioscopy showed chronic glaucoma, type 1. An operation was advised but refused. The patient was next seen on February 10, 1936, when vision bilaterally was amaurosis, tension R. +3, L. 130 mm. Hg (McLean). The left eye showed moderate caput medusae, deep anterior chamber, and iridodonesis. After an instillation of 1-percent eserine tension in the left eye was 90 mm.

Operation was performed on February 11, 1936, an incision of Schlemm's canal (goniotomy) from the 9:00- to the 6:00-o'clock position. On February 14th the tension in the left eye was 28 mm. (with pilocarpine); on February 28th, 18 (without drops); on April 24, 1936, 24 (without drops).

Summary: In a case of absolute glaucoma tension was reduced from 90 to 28 mm. Hg. The last observation was made two months after operation.

Case 5. Mr. M. L., aged 65 years, was first seen on July 22, 1935. The right eye, blind from glaucoma since 1930, had been enucleated in 1932. Vision in the left eye was 1.0 and J 1. He had been seeing haloes in this eye for two months. Tension was 70 mm. Hg under 1-percent pilocarpine (given at three-hour intervals). On August 29, 1935, the tension was 120 in spite of 0.5-percent eserine.

Microgonioscopy showed chronic glaucoma, type 1.

Operation. On August 30, 1935, an incision of Schlemm's canal (goniotomy) was made. On November 5th, tension was 26 (without drops); on April 4, 1936, it was 35 mm. (last drop of pilocarpine 4 hours previously).

Summary: Tension was reduced from 120 to 35 in a case of unilateral glaucoma. The time of observation was eight months.

Case 6. Mrs. K. B., aged 64 years appeared for treatment on March 5, 1936, because of secondary glaucoma in the right eye following an injury while hammering on metal 12 years before. This eye showed traces of a perforating injury with minute foreign bodies. A corneal scar, hole in the iris, posterior cortical cataract, and total excavation of optic nerve with atrophy were found at examination. X-ray films were negative. Vision in the right eye was hand movements in the temporal field, in the left eye 1.0 and J 1. Tension in the right eye was 110, in the left 32 mm. The slitlamp showed pigment dust on Descemet's membrane.

Microgonioscopy showed a porcelainlike appearance of the corneoscleral trabeculum denoting blockage.

At operation, March 6, 1936, an incision of Schlemm's canal was made (goniotomy). On March 17, 1936, a slight iridocyclitis was relieved by local treatment. On May 13, 1936, tension in the right eye was 27, in the left eye 33 mm. Hg (without drops).

Summary: In a case of secondary glaucoma, following perforating injury, tension was reduced from 110 to 27 mm. Hg. The period of observation was two-and-one-half months.

Case 7. Mr. L. P. L., aged 69 years, was seen on March 4, 1936. Both eyes had been trephined for chronic simple glaucoma elsewhere in 1932. Vision in the right eye was 0.3 and J 4, in the left eye 0.1 and J 4. There were posterior cortical cataracts. Tension in the right eye was 30, in the left 50 mm. Hg under pilocarpine.

Microgonioscopy showed the iris adherent to the inner trephine opening. In the left eye the latter was also covered by a membrane; the remaining angle was open and showed moderate sclerosis and pigmentation of the trabeculum.

Operation on March 19, 1936, was an incision of Schlemm's canal (goniotomy) without the surgical contact glass. Two days after the operation, following a vomiting spell, the patient complained of pain in the left eye and the anterior chamber was found to be full of blood. The tension was 80 mm. Hg. On June 5, 1936, three months thereafter, the tension in the right eye was 30, in the left eye 45 mm. Hg. Vision in the right eye was 0.3 and J 2, in the left eye 0.1 and J 3 eccentric, unchanged.

Summary: A secondary hemorrhage into the anterior chamber resulted in a protracted convalescence and no benefit from the operation. Probably a vessel was eroded at the time of operation. This cannot occur with the new technique of operating under direct magnified vision with the surgical contact glass.

Case 8. Mr. J. H. P. was seen on November 18, 1935. An intraocular bit of steel had been extracted from the left eye 10 years previously. This eye had been aching for

three weeks. Vision in the right eye was 1.0 and J 1, in the left eye amaurosis. The X-ray examination was now negative. Tension in the right eye was 30 and in the left eye 100 mm. Hg.

Microgonioscopy showed sclerosis of the corneoscleral trabeculum.

At operation an incision of Schlemm's canal was made (goniotomy). On November 22, 1935, the tension in the right eye was 30, in the left 32 mm. Hg.

Summary: In a case of secondary glaucoma subsequent to intraocular steel, 10 years previously, tension was reduced from 100 to 32 mm. Hg. The period of observation was one week. The patient reported by letter that his eye has been comfortable and unchanged since his last visit.

Case 9. Mr. A. B., aged 26 years, had been struck in the left eye by a rock 15 years previously. Recurring attacks of supraorbital pain of increasing intensity had been suffered for the last several weeks. Enucleation had been advised elsewhere. Vision in the left eye was light perception, no projection, in the right eye 1.0 and J 1. Tension in the right eye was 30, in the left eye 65 mm. Hg.

Microgonioscopy showed iridodialysis from the 3:00- to the 4:30-o'clock position; peripheral adhesion of iris (scleral) from 4:30 to 7:00 o'clock and the rest of the angle open and showing a definite sclerosis of the corneoscleral trabeculum, with pigment dust sprinkled over it.

Operation, February 28, 1936, on the left eye was an incision of Schlemm's canal (goniotomy) from the 11:00- to the 8:00-o'clock position. On February 29th, the tension was R. 20 mm. and L. 23; on March 27th R. 25, L. 10 mm. This operation was conducted under the surgical contact glass.

Summary: In a case of secondary glaucoma, posttraumatic with aphakia, tension in the left eye was reduced from 65 with drops to 10 mm. Hg without drops. The period of observation was four weeks.

Case 10. Mrs. F. F., aged 68 years, was seen on March 9, 1936, presenting a case of glaucoma lenticulo-capsulare (Vogt) or chronic glaucoma with exfoliation of the lens capsule. Vision in the right eye was 0.8 and J 1, in the left eye 1.0 and J 1. The tension (McLean) R. was 65 mm. Hg, L. 45, under pilocarpine. Enlargement of blind spot and progressive excavation of the optic discs, greater on the right than on the left, were noted.

Microgonioscopy showed chronic glaucoma, type 1.

Operation was performed on May 16, 1936, an incision of Schlemm's canal (goniotomy). On June 18, 1936, tension R. was 35, L. 33; on June 26, 1936, R. 35, L. 35 (under pilocarpine). The operation was conducted under a surgical contact glass.

Summary: In a case of chronic glaucoma, type 1, with exfoliation of the lens capsule, tension in the right eye was reduced from 65 to 35 mm. Hg. The period of observation was six weeks.

Case 11. Mr. E. P., aged 70 years, was seen on April 29, 1936, complaining of gradual failure of vision, greater in the left than in the right eye, for one year. Vision in the right eye was 0.6 and J 1, in the left eye finger counting. The visual field was contracted in the left eye. Tension R. was 32, L. 40 mm. Hg under pilocarpine.

Microgonioscopy showed chronic glaucoma, type 1, with exfoliation of lens capsule.

Operation on May 15, 1936, was an incision of Schlemm's canal (goniotomy). On June 19th, tension R. was 35, L. 15 mm. Hg (pilocarpine R.E. only). The operation was performed under surgical contact glass.

Summary: In a case of chronic glaucoma with exfoliation of the lens capsule, tension in the left eye was reduced from 40 with pilocarpine to 20 mm. Hg without pilocarpine. The period of observation was five weeks.

Conclusions

A new surgical procedure for the relief of chronic glaucoma, which consists of opening Schlemm's canal under direct magnified vision, is herewith reported. It would seem to be the rational technique for the relief of a disease which is the commonest cause of blindness in middle or later life. It is indicated in what has here been classified as type-1 primary chronic glaucoma. This type includes over 50 percent of all chronic noncongestive cases, and may prove to include an even considerably higher percentage. In this type, judging from my experience to date, the properly performed operation under a specially devised surgical contact glass is without danger and its results promise to be permanent. It is also indicated and equally successful in certain cases of secondary glaucoma, the operability of which may be definitely ascertained by preoperative biomicroscopic examination. Its simplicity, preoperative predictability of outcome, and its certainty of success in indicated cases are such as to make it appear an ideal procedure. It is particularly gratifying in the following conditions:

(1) In all cases of type-1 chronic glaucoma, in which it is indicated as the only rational procedure because it restores the physiological function of Schlemm's canal with a minimum of trauma, and with an absence of hazard, in contrast with attempts to establish permanent artificial drainage, as in

present-day operations for glaucoma with their well-known disadvantages and dangers.

(2) In early cases in which the patient cannot be relied upon to use miotics regularly nor to keep in regular touch with an ophthalmologist.

(3) In cases which run a nocturnal or early morning hypertension in spite of the use of miotics. In such cases normalization of tension throughout the 24 hours is often essential to the preservation of function.

(4) In late cases, in which only a small amount of field of vision is left and the other eye is already blind. In these desperate cases it is equally effective and, because of its lack of danger, especially indicated.

(5) In absolute glaucoma, regarded by most ophthalmologists as a "noli me tangere," provided the angle is open.

In this operation there is no danger of late infection, there being no communication with the outside; no danger of internal hemorrhage, as the incision can be properly placed under direct vision to avoid the vessels of the ciliary body; no danger of prolapse of parts; no danger of sudden reduction of pressure immediately following the operation, inasmuch as the anterior chamber is retained or at least practically no aqueous is lost; and no danger of a return of the increased intraocular pressure. According to my experience to date, this operation does away with the immediate and late dangers of the present-day operations and is eminently more successful in reducing pressure to normal. It would seem possible, therefore, that it may replace these operations in all cases of type-1 chronic glaucoma and in some cases of secondary glaucoma. It has already done so in my hands.

In fairness to the patient and in order not to discredit the operation, a proper biomicroscopic diagnosis of chronic

glaucoma of type 1 should always be made before operating. In spite of the apparent simplicity of the operation and perhaps because of this very simplicity, one should approach it with a high degree of deliberate care. One is dealing here with a very exact form of surgery—one may indeed say with *intraocular microsurgery*, which demands a correspondingly exact knowledge of the living angle on the part of the surgeon and a preoperative examination and diagnosis with a binocular microgonioscope, in order to assure good surgical results. A note of warning must be sounded in this regard, for without preoperative biomicroscopic examination the improper selection of a case (for instance, one with peripheral adhesions, a shallow angle, or an aberrant artery of the ciliary body) may well occur and lead to serious consequences. On the other hand, when the indication for operation has been properly and definitely established, I know of no intraocular operation that is so neat, smooth, and certainly effective as is this one.

Summary

It is suggested that this operation, which restores the physiological function of Schlemm's canal, solves the surgical problem of most cases of chronic primary glaucoma. It is equally successful in certain cases of secondary glaucoma. The results are predictable and appear to be permanent. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber and Schlemm's canal are under full view and magnified during the operation. The operation is without danger when the proper technique is used and has proved completely successful in the writer's hands when certain preoperative indications (binocular biomicroscopic diagnosis) have been fulfilled.

490 Post Street.

Bibliography

- ¹ Heine. In Graefe-Saemisch Handbuch der Augenheilkunde, 1922, v. 1, pp. 872, 878.
- ² Curran, E. J. A new operation for glaucoma involving a new principle in the etiology and treatment of chronic primary glaucoma. Arch. of Ophth., 1920, v. 49, p. 131.
- . Peripheral iridotomy in chronic glaucoma. Trans., Sect. Ophth., Amer. Med. Assoc., 1923, p. 75.

- ³ Barkan, Otto. The structure and function of the angle of the anterior chamber and Schlemm's canal. *Arch. of Ophth.*, 1936, v. 15, January, pp. 101-110.
- ⁴ ———, Boyle, S. F., and Maisler, S. On the genesis of glaucoma: An improved method based on slitlamp microscopy of the angle of the anterior chamber. *Amer. Jour. Ophth.*, 1936, v. 19, March, no. 3, pp. 209-215.
- ⁵ ———, Boyle, S. F., and Maisler, S. On the surgery of glaucoma: Mode of action of cyclodialysis. *Amer. Jour. Ophth.*, 1936, v. 19, January, no. 1, pp. 21-25.
- ⁶ Salzmann. Die Ophthalmoskopie der Kammerbucht. *Zeit. f. Augenh.*, 1914, v. 31, and 1915, v. 34.
- ⁷ Trantas. Sur la gonioscopie (Ophtalmoscopie de l'angle irido-cornéen). *Arch. d'Opht.*, 1928, v. 45.
- ⁸ Troncoso. Gonioscopy and its clinical applications. A gonioscopical study of anterior peripheral synechiae in primary glaucoma. *Amer. Jour. Ophth.*, 1925, v. 8, p. 433.
- ⁹ ———. Closure of the angle of the anterior chamber in glaucoma. *Arch. of Ophth.*, 1935, v. 14, October, pp. 557-586.
- ¹⁰ Koeppe. Ueber den derzeitigen Stand der Glaukomforschung an der Gullstrand-schen Nernstspaltlampe sowie den weiteren Ausbau des Glaukoms. Frühdiagnose vermittelt dieser Untersuchungsmethode. *Zeit. f. Augenh.*, 1918, v. 40, p. 138.
- ¹¹ Thorburn. Svenska Lak. Sallsk. Handl., 1927, v. 53, pp. 252-272; 273-291.
- ¹² Werner, S. Gonioscopical studies of operated cases of glaucoma. *Acta Ophth.*, 1931, v. 9, pp. 112-116; 1932, v. 10, pp. 426-563.
- ¹³ Ascher. Zur Mikroskopie des lebenden Auges. *Klin. M. f. Augenh.*, 1927, v. 78, p. 628.
- ¹⁴ Bruce, G. M. Vizualization of foreign bodies in the irido-corneal angle. *Arch. of Ophth.*, 1933, v. 10, Nov., pp. 615-620.
- ¹⁵ Castroviejo. Goniophotography. Photography of the angle of the anterior chamber in living animals and human subjects. *Amer. Jour. Ophth.*, 1935, v. 18, June, no. 6.
- ¹⁶ Elschnig, A. Zur Wirkungsweise der Zyklodialyse. *Ber. d. Deutschen Ophth. Gesell.*, 1932, p. 277.
- ¹⁷ Vannas, M. Zyklusoskopische Untersuchungen über das Verhalten des Strahlenkörpers nach der Heineschen Operation. *Klin. M. f. Augenh.*, 1935, v. 95, p. 629.
- ¹⁸ Henderson. Glaucoma. London, 1910.
- ¹⁹ Levinsohn. Zur Entstehung des Glaukoms durch Pigmentinfiltration der vorderen Abflusswege des Auges. *Zeit. f. Augenh.*, 1918, v. 40, p. 344; *Arch. f. Augenh.*, 1908, v. 62, p. 130.
- ²⁰ Schieck. *Ber. d. Ophth. Gessell.*, Heidelberg, 1919, v. 41, p. 68.
- ²¹ Priestley Smith. Glaucoma, its causes, symptoms, pathology and treatment. London, 1879.
- ²² de Wecker. *Ann. d'Ocul.*, 1898, v. 119, p. 102.
- ²³ De Vincentiis. Sulla incisione dell'angolo irideo (Taylor). *Ann. di Ottal.*, Pavia, 1891, v. 20, p. 92.
- . Incisione dell'angolo irideo nel glaucoma. *Ann. di Ottal.*, Pavia, 1893, v. 22.
- ²⁴ Valude and Duclos. Du débridement de l'angle iridien. *Ann. d'Ocul.*, 1898, v. 119, p. 98.
- ²⁵ Czermak. Die augenärztlichen Operationen. Berlin, Urban and Schwartzberg, 1908, v. 2, p. 233.
- ²⁶ Meller, J. Augenärztliche Eingriffe. Vienna, J. Safar, 1921, p. 321.
- ²⁷ Scalinci. *Ann. di Ottal.*, 1900, v. 29, pp. 324-335; 1902, v. 31, pp. 588-594.
- ²⁸ Dvorak-Theobald. Schlemm's canal: Its anastomoses and anatomic relations. *Trans. Amer. Ophth. Soc.*, 1934.

Discussion. DR. G. D. THEOBALD: Is the trabecular pigment band composed of real pigment, or do the openings in the trabeculum give the appearance of darkness, as the hole in the iris gives a black pupil?

DR. O. BARKAN: The trabecular pigment band is composed as far as one can tell (under 40 linear magnification) of real pigment. The pigment of which it is composed differs slightly in appearance from the pigment granules which fall on to the angle wall below physiologically. Its color is gold-brown, and it consists of granules differing in

size from that of pigment dust to pigment particles.

The pores in the trabeculum are not visible with the apparatus I am using at present. One is merely cognizant of a trabecular network or weave.

DR. THOMAS D. ALLEN: Does a high degree of intraocular tension or previous inflammation contraindicate the operation?

DR. O. BARKAN: High intraocular tension does not contraindicate the operation. The highest tension in an eye on which I have operated was 120 mm. Hg (McLean). The patient was a young

man who had secondary glaucoma following an injury some 10 years previously. The tension was reduced to around 30. I have had other cases, also, of very high tension.

Previous inflammation probably does play a role. I am not qualified to answer that question definitely. My impression, judging from the literature, and the observations, especially those made by Troncoso, is that as a result of congestive periods, or periods of compression, peripheral iris adhesions form. These would, I feel, contraindicate the operation as it is herewith described. It may be that this method should be used in such cases as well, but I have not yet operated on any patient by cutting through a peripheral iris adhesion.

DR. A. W. McALESTER: What magnification do you use on the microscope during operation?

DR. O. BARKAN: The magnification of the contact glass, combined with the media of the eye, is about one-and-a-half times linear. During operation I have used a head loupe and a plus-two sphere fitted over my distance correction. As I am not yet manifestly presbyopic, the plus-two sphere simply enables

me to get closer, so I imagine the actual magnification during the operation is from two to two-and-a-half times linear.

DR. LEO L. MAYER: Would Dr. Barkan hazard an explanation of why a trephine operation lowers and maintains lowered tension in some cases in view of his theory?

DR. O. BARKAN: The trephine operation acts, I take it, as a decompression operation does in the skull in the case of hydrocephalus, permitting drainage to the outside, but it has nothing to do with the actual obstruction that is causing the increased intraocular pressure; no more than a decompression operation of the skull has to do with the cause of hydrocephalus.

I would say, by comparison, if hydrocephalus were caused by an obstructing membrane over the aqueduct of Sylvius and it were possible by an incision to open this membrane and reestablish communication, without hurting the patient, that would be analogous to the operation which I have described; in contradistinction is trephining, which acts as a palliative reducing operation but not as a causal one.

AN INVESTIGATION OF THE ANGULAR RELATION OF THE VISUAL (VISIERLINIE) AND OPTIC (CORNEAL) AXES OF THE EYE

GEORGE E. PARK, M.D.
CHICAGO

The visual axis has hitherto been postulated as a straight line from the point of fixation to the fovea but, in this investigation, it is apparent that, while this theoretic straight line does exist from the point of fixation to the cornea, a deviation usually takes place at the corneal surface by reason of its lack of centration on the visual axis. A further deviation appears to occur at the lens: By the action of the ciliary muscle the lens is shifted bodily or is formed into a prismatic shape by the unequal action about its margin, either or both, and this functions to bring the image of the point of fixation upon the fovea in conjunction with the action of the extrinsic muscles. This relation of the ciliary muscle and the extrinsic muscles is found to vary with adaptation, fatigue, and possibly other causes, and results in a varying relation of the visual and optic axes, previously assumed to be constant. From the Department of Ophthalmology, Northwestern University Medical School. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936.

The optic axis of the eye is readily found by observing the angular reflection at the corneal surface of an illuminated object and computing the axis by well-known formulae. But the visual axis (visierlinie) is not to be determined in this manner, for it is in no wise related either to the optic axis or to angular reflections at the corneal surface. Many investigators of ocular movements have assumed a definite relation between such angular reflections at the corneal surface and the visual axis; but, as stated, it does not exist. In our work use was made of a specially constructed instrument¹ embodying a head support, a telescope, and an arc graduated from zero at its center toward either end. The optic axis of the telescope always intersects the center of generation of the arc as the telescope is moved along the arc. The telescope and arc are rigidly connected so that they move together when adjusted horizontally or toward or from the patient's eye. At the anterior end of the telescope and just posterior to the telescope objective is a heavy black circle centered on the optic axis of the telescope and at its posterior end is an illuminated wheel-shaped target with bright rim, spokes, and hub, also centered on the optic axis. At the telescope eyepiece is a scale consisting of a horizontal and a vertical line which intersects at the optic axis. The patient's head being fixed in the head support, the telescope is located at zero on the arc and is ad-

justed horizontally and vertically until the patient sees the target centered within the black circle. As the target just fits within the black circle and as each is centered on the optic axis it is seen that the optic axis of the telescope now coincides with the visual axis and that angular measurement of the visual axis during a movement of the eye is indicated by the angle to which the telescope has moved from zero on the arc, the patient steadily fixating the center of the target. A second target consisting of a small red spot is adjusted horizontally and vertically just before the telescope until the patient sees the red spot centered on the hub of the target. The red spot also is now centered on the visual axis. This red spot is fixed in relation to the patient's head and does not move with the telescope as does the wheel-shaped target.

When the instrument is adjusted as described we term it to be in the primary position.

A short digression into geometric optics will assist in making clear that which follows. The theory of image formation comprises a positive lens centered on its optic axis. This centration is accomplished by locating the center of curvature of each surface of the lens on its optic axis. A ray of light passing along the optic axis will meet each lens surface perpendicularly and will pass undeviated through the lens as a straight line along the optic axis. Conversely, such partial reflection as occurs

at each lens surface is undeviated, but is reflected back along the optic axis; that is, the light ray passing along the optic axis and reflected at either lens surface returns along its original path, a straight line. Light rays from a myriad of points comprising the form and detail of an object are converged by the lens to form corresponding image points which form the shape and detail of the image as a replica of the object. If, now, we consider this lens to be the crystalline lens and locate just before it a convexo-plane lens with its plane surface toward the lens and perpendicular to its optic axis and with the center of curvature of the convex surface also located on the optic axis, we may consider this convex surface to be the cornea of a schematic eye in which both cornea and crystalline lens are centered on the same axis. Assuming this axis to be the visual axis, it is seen from the above that an axial ray will pass through both lenses in a straight line and we have a "straight-line visual axis," which has been postulated from time immemorial. That this is not the case is the consensus of opinion of all investigators who find the cornea to have an axis of its own (the optic axis), which seldom coincides with the visual axis. Therefore, the cornea, at the visual axis, is not perpendicular thereto by reason of the angle between the corneal and visual axes. This angle we term the Physiological Angle, which is the subject of the present discussion.

In a previous research by R. S. Park and G. E. Park,² the visual axis was found to pass always through a point 13.8 mm. posterior to the cornea of an emmetropic eye when the gaze is directly forward. An advancement of the eye occurs in a nasalward excursion and recession in a templeward excursion, with the visual axis constantly passing through this point. This point is fixed in relation to the head but not in relation to the eye and is the "logical" center about which angular measurement

should be made and not the so-called center of motion.

The instrument* was constructed to locate the center of generation of the arc at this point and for this reason. It was accomplished by constructing the telescope objective with a posterior focus which falls at the target as well as at the eyepiece scale, each equidistant from the objective, and with an anterior focus which falls 7 to 8 millimeters posterior to the cornea. The center of generation of the arc is positioned 6 millimeters posterior to this focus within the eye when the focus lies 7.8 mm. posterior to the cornea. In the conditions here employed, 7.8 mm. is taken as the average radius of the cornea in emmetropia; 7.8 mm. plus 6 mm. equal 13.8 mm. posterior to the cornea, which point may be called the visual center of the eye.

The arc center is located in relation to the center of corneal curvature and not in relation to the cornea and is correctly located for corneal radii of less or more than 7.8 mm. by employing the method next described.

In conducting an examination, the patient's head is fixed in the head support and the instrument adjusted to the primary position as described. The telescope, rigidly connected to the arc, is next adjusted toward or from the eye until the image of the target, reflected at the cornea, is clearly focused at the eyepiece scale where it is viewed by the observer. The anterior focus of the objective is thus located to intersect the center of corneal curvature, irrespective of what the radius of curvature of the cornea may be. When the target image is focused at the eyepiece scale, light from the target passing through the objective is converged by the objective to focus at the corneal center of curvature but, meeting the cornea, certain rays fall perpendicularly upon the cornea and are reflected directly back to the objective which converges them to focus at the eyepiece scale the same distance from the objective as is the target. Other rays, reflected at slight angles, make up the physical dimensions and luminosity of the image. If the corneal center of curvature be on the visual

* The instrument was designed and constructed by Mr. Clile C. Allen to whom I wish to pay my debt of gratitude for his untiring service and interest in this work.

axis, the target image would be seen centered on the eyepiece scale. This, however, is seldom the case. The image is usually seen to lie below and at one side of the center of the eyepiece scale and at varying distances from the center in the same subject. The angle between the corneal and visual axes, the physiological angle, is found by directing the patient to fixate the center of the red spot and moving the telescope along the arc until the target image is seen centered on the vertical line of the eyepiece scale. The angle now indicated on the arc is the physiological angle.

We find it à propos to discuss the generally accepted beliefs regarding the shape of the anterior surface of the cornea. It was formerly represented as ellipsoidal but, according to the results of numerous investigators, especially Gullstrand and Blix, it can, in general, be assumed to be of spherical shape for the portion utilized over a pupil of normal size. According to Gullstrand, that portion of the cornea which can be considered as spherical extends about four millimeters horizontally and slightly less vertically. It is decentered outward and slightly downward in most cases. As a matter of interest, the results would be the same whether the cornea were considered as spherical or ellipsoidal.

In order to avoid confusion and to orientate ourselves with reference to the other angles which are so often mentioned in this connection, we must digress for a short time.

The principal purpose of a language is to express thought so that it may be readily understood by others. Unfortunately, this purpose has been neglected in the field of physiological optics in discussing the angle made by the optic and visual axes. No doubt, angle alpha, beta, gamma, and angle kappa of Landoldt convey a definite meaning to the reader. However, I doubt whether he would be able to differentiate between them with exactness and yet be in accord with his colleagues. I can assure him that even if he scans the literature and looks for help he would still be as muddled afterwards as before. As has been very aptly expressed in the

American Encyclopedia and Dictionary of Ophthalmology, these terms are used "according to the individual author's definition."

Generally the angle alpha is defined as being the angle formed by the junction of the visual axis and the optic axis. Other authors classify the angle between the optic axis and the visual axis as angle beta.

Some authors use angle gamma merely as another name for the angle alpha or beta while others use it as the angle formed between the line of fixation (that is, a line from the object observed to the center of rotation of the eye, which has been proved as nonexistent) and the optic axis. Other authorities use it as the angle formed between the visual axis and the center of the pupil.

Angle kappa is described as the angle between the line of fixation and the line normal to the cornea that passes through the pupillary center.

As to their practical usefulness, the angle between the visual axis and the center of the pupil is of far greater importance in strabismus. In most cases, the visual axis lies to the nasal side of the pupil. Thus, when the visual lines are parallel a large angle may give rise to a deceptive appearance of divergent squint. Similarly, when the visual axis lies on the opposite side of the pupil under the same conditions one may mistake it for convergent strabismus.

It appears to the writer that there should be some means by which a standardized nomenclature could be established for these angles, thereby avoiding such confusion in future publications.

The term "physiological angle," here used, corresponds to the angle alpha as used by most authors; that is, between the visual axis (*visierlinie*) and the optic axis.

Unfortunately, most of the investigators of ocular movements have made use of an extrinsic light reflected from the cornea and by observing the reflection have computed their findings.

The data given are made up of apparent causes and effects with no thought of claiming an exact pattern of the movement, but instead, the ex-

tremes (limits) of such changes in position, in the eye during fixation, as have been observed, will be considered. It is believed, however, that the angular measurements are exact.

While a definite physical explanation of this phenomenon cannot be given, the facts observed are here reported, with what seems the most likely theory to explain them.

History

Hess⁸ made a thorough investigation of the movements of the lens during accommodation and found that there is considerable movement of the lens downward, as described by Tscherning. Hess claimed that the lens sinks downward by gravity, about .25 to .36 millimeters but that the direction in relation to the pupil is dependent upon the position of the head, and that the movement does not occur when the iris is horizontal. He observed also, in an eye which had been eserinizied, a maximum movement of one millimeter when the head moved through an angle of 180 degrees from shoulder to shoulder.

Hess further observed a marked shaking of the lens in an eserinizied eye, with every movement of the head, the phenomenon disappearing after the instillation of atropine. This movement was most marked when the head was held backwards. The lens seemed to make three or four oscillations after cessation of the head movement from side to side.

In determining the movement of the lens a point of light was used which had a constant position relative to the eye; during strong accommodation there was an apparent rise of the point of light, showing a downward movement of the fovea centralis.

Hess and several other observers⁴ noted irregularities of the border of the lens such as might be due to greater pressure on one part than on others. Hess observed that this wavy border became quite uniform after the instillation of eserine.

Hess also observed a certain phenomenon which he believed was probably due to the fact that the iris and ciliary musculature did not function

simulateously. In substantiation he cited certain observations.

Peckham⁵ questioned our right to assume that objects are fused by mechanism of neural anatomy rather than perception after he made certain observations which he used to locate images in relation to the fovea according to the present knowledge of foveal projection.

In order to make these observations he had constructed a large and very accurate stereoscope with the mirrors so arranged that the subject sees a large black field with the right eye and another similar field with the left eye. Use was made of two telescopes placed behind the large fields of the stereoscope so that they were focused on the subject's eye. By this arrangement, the movement of the eyes could be observed and recorded on a circular scale.

Identical pictures, to be fused by the subject, were placed in each half of the stereoscope. By placing prisms in the base-out or base-in positions Peckham was able to carry the subject almost to diplopia while the latter still reported fusion or oneness. The eyes of the subject, in overcoming a 10-degree prism, moved through angles often less than half this amount, although occasionally they moved even too far to bring the foveae beneath the images. Hence, Peckham concluded that the fovea was 3 to 4 degrees from the ideal position. He observed, moreover, that when certain subjects were required to look successively without mirrors at two points on a large perpendicular field at a distance of half a meter, although each point was placed equally distant from a mid-line (which should have required the same amount of convergence) there was as much as 4 or 5 degrees of difference between these two fixations.

Clark⁶ has constructed a Wheatstone stereoscope which was mounted on a camera so that the ocular movements could be photographed while the eyes were observing the stereograms.

The photographs were made while the subjects alternately fixated two specific points in a complex stereoscopic picture. These points were selected so as to require a maximum of convergence and divergence during the

change. In order to determine the influence of context on the eye movements, the identical points were reproduced on white cardboard.

He concluded, as Verhoeff had previously done, that stereoptic perception is to be explained fundamentally as the result of the cerebral organization and unification of a series of intermittent retinal impressions which occur as clear vision changes from one eye to the other. He interpreted certain observations that he made thus: that the eyes moved at random sufficiently fast to cause a definite diminution of vision; that convergence had no effect on fixation; that any position within an area of 1 degree to 1.5 degrees from the center of the fovea may be used to "fixate" a point. The randomness and irregularity is a characteristic rather than an exception. Wide individual differences in behavior of the eyes are found in successive performances.

Experiments

Only those subjects were used who were able to concentrate sufficiently well to maintain fixation upon the center of the target or supplementary red spot, and it was insisted that they do this at all times during the measurements. In age they ranged from 12 to 70 years.

As mentioned above, the image of the target was rarely found to be reflected directly back along its path but instead was usually observed below the horizontal line and to one or the other side of the vertical line of the eyepiece scale. Means were provided in the construction of the instrument for the exact measurements of the angle of reflection from the vertical line. The instrument had been constructed with the idea that there would be no shift of this angle and it was hoped to make an exact measurement of the angle between the visual axis and the optic axis, which had been presupposed to be fixed; but this the observations have shown is not the case.

It was noticed that this "reflex" changed its relationship to the lines of the eyepiece scale while the subject was fixating the center of the target

during the time observations were being made through the instrument. But with some subjects this angle would remain fixed over a period of several minutes or until they changed their point of regard momentarily, when a change would be noticed. In others the angle remained stationary for only a few minutes, when it would either begin to diminish or increase to a certain limit where it became fixed for a short period, then reversed and continued to the original position and even beyond. It could at any time become momentarily fixed at any position within the limits of this excursion. In other subjects there was almost a continuous randomness present with only a short pause made at different positions in the excursion. Some subjects showed a much greater limit of variation than others but the extremes would reach as much as twice or more the initial reading. There are no norms, not even for the same individual.

The following drugs were used in our endeavors to establish a control of this phenomenon; eserine, homatropine, and atropine. Observations were made immediately after the instillation of eserine and homatropine, and were continued for an indefinite length of time, even to two or three hours. Atropine was used several days before observations were made.

Invariably, immediately after the instillation of eserine the angle became much smaller, where it would remain for a short time and then increase beyond the original amount. After three or four instillations of 0.25 percent eserine, it was noticed that the reflex moving at random, would gradually approach the horizontal line, even rising above it, but at once would drop below again. Eventually with marked randomness (and sometimes requiring an hour or so) the reflex would appear at the intersection of the horizontal and vertical lines. At that time the angle had become zero, varying perhaps from plus 1 degree or 2 degrees to minus 1 degree or 2 degrees where it would remain. Under that condition, the image of the target was being reflected back along the visual axis, which at that time was

corresponding to the optic axis of the eye and the optic axis of the instrument.

With homatropine, a different condition developed. Immediately after its instillation the angle would undergo a change; sometimes it would increase and at other times diminish. The general randomness was similar to that noticed with eserine, and in a majority of cases, the angle would eventually approach zero. There were many exceptions to this, for in many cases the final results might be that the angle had increased from 6 or 8 degrees to 17 degrees, where it would remain more or less fixed. Apparently, the angle did not change from one position to another so readily after the homatropine had become fully effective, especially if the eye were held in fixation. But if there were a change in the point of regard and the target were fixed again, at times a definite oscillation of the reflex was observed, resulting eventually in a different angle between the optic and visual axes.

A condition very similar to that developed with homatropine was observed with atropine. A more complete study of atropine is being made at the present time.

In measuring aphakic patients, another important observation was made. Some difficulties were experienced in establishing coincidence of the visual axis and optic axis of the instrument on account of low visual acuity, but by allowing the subject to select the position which appeared to be the clearest, the physiological angle would become zero without exception, provided post-operative refraction had secured practically normal vision.

Another check that was used was to move the instrument until the physiological angle was brought to zero, at which time the subject would invariably report the most acute vision of the target within the circle; the zero position being reached without the knowledge of the subject excepting as the position of the most acute vision.

This corresponds very closely, if not identically, with the condition which was caused by eserine in establishing

coincidence of the optic and visual axes of the eye with the optic axis of the instrument during fixation.

Thus far, the observations have been objective in nature, but there are certain subjective findings which have been verified and which corroborated the objective.

The author has on various occasions, acting as a subject, observed that at times the eye seemed to be making certain movements beyond his control and against his will.

This same phenomenon has been introspectively experienced and reported by another observer* who served as a subject on several occasions.

At the first examination with him as subject, consecutive readings showed a steady fixation. At that time he did not observe any unusual introspective phenomena. When, however, at a subsequent examination he was in a state of fatigue due to a considerable loss of sleep and to having been under prolonged nervous strain, he noticed introspectively that his fixation was very unsteady. At certain times the image of the target became blurred and at such times he declared he could recognize a definite pull occurring within his eye. He also declared that at this time he recognized the fact that the eye itself was making definite involuntary movements (reflex movements) but at the end of these reflex movements, the image became clear again.

He subjectively was able to identify and to report the exact time of the reflex action by the manifestation of a large excursion during which time the author was able to verify the same objectively. Conversely, the author could independently observe this reflex, and report it to the subject who would substantiate subjectively its manifestation.

Theory

As optical physicists, we like to believe that in binocular foveal fixations there is a constant geometric setup, such as is shown in diagrams with which we are familiar—that is to say,

* Dr. A. C. Ivy, Professor of Physiology, Northwestern University, is the observer mentioned.

two symmetrical lines of incidence from the object point, through the corneae and the nodal points, to the foveae. Physiologically it is unthinkable. Constancy of physiological functions pertains to results, not to detailed mechanism.

In a man-made device the fixed relation of its parts insures identical results at all times. Many devices may be constructed, each embodying a different relation of its parts, all of which obtain identical results.

A natural creation differs therefrom; it cannot utilize such fixed construction but must function by adaptation of such means as are best suited. A subject may fixate a point but, as fixation is prolonged, the means appear to change their relation and this change is evident in varying amounts in observations made at intervals during prolonged fixation. Nature aims only at success and this is attained by adaptation of the most suitable means at any particular moment.

So, in binocular foveal fixation, it can, we think, be assumed that the resultant remains constant; that is, that the two foveae are kept steady under the central images. But it would be unreasonable, knowing what we know about neuromuscular function, to suppose that the flow of muscle effort, the muscular pattern, maintains the same line of direction and the same relative quantities at all times in an absolute sense.

If nothing else occurs, it is almost certain that innervation and contraction, both in the ciliary muscles and in the extrinsic muscles, shift from one group of muscle fibers to another, as they do in all muscles under continued effort. But it is very likely that the changes are of a grosser character than that. Almost certainly the entire musculature shifts its line of force, so that the extrinsic muscles change the angle of fixation and the ciliary muscles change the shape and curvature of the crystalline lenses, but with an uncanny coördination which maintains the same resultant; namely, the focusing of the central images on the two foveae.

Possibly the extrinsic muscles rotate

the eye to approximately the point of fixation and the ciliary muscle acts as what might be termed a fine adjustment for exact fixation by means of this change in the shape of the lens. In prolonged fixation it is quite possible that, due to innervation and contraction, the extrinsic muscles act to shift the fovea away from the image and that the ciliary muscle acts to shift the image to the new foveal position.

Conversely, it is also possible that the ciliary muscle, for the same reason, shifts the image and that the extrinsic muscles rotate the eye to bring the fovea beneath this new image position.

The theory of fixation by the extrinsic muscles only appears to be modified in this respect. Inversely, in an aphakic eye the ciliary muscle cannot exert this influence and fixation is entirely accomplished by the extrinsic muscles.

This being the case, the line of incidence would not always be two straight lines from the object-point, through the corneae and nodal points, to the foveae. They would sometimes pierce the corneae eccentrically, and be bent by a prismlike effect of the nonuniform shape and curvature of the lenses. This is apparently what takes place under our observations.

The question as to which muscles originate the shift, the ciliary or the extrinsic muscles, and which compensate is hard to answer, as we have mentioned before, for they are probably interchangeable.

The whole matter is undoubtedly one of adaptation and fatigue, plus an uncanny coördination to maintain a desired resultant. Varying conditions would seem to vary the rôle of originator and compensator between these muscles.

Conclusions

1. The described method of securing coincidence of the optic axis of the telescope with the visual axis is accurate to within a maximum error of one-fourth degree.

2. The amount of error in identifying the visual axis by means of the red spot is of the same order as given above.

3. The angular relation of the optic and visual axes is a variable which accounts for different readings over a series of observations or consecutive readings within a short period.

4. These variable readings can scarcely be attributed to any corneal change nor to a change in the anatomical position of the fovea.

5. This leaves but one factor within the eye to account for such variation, the crystalline lens. Possible unequal action of the ciliary muscle, causing prismatic action of the lens by excessive compression at a portion of the lens margin or bodily decentration of the lens from the then existing visual axis,

would account for such variation.

6. The described effect of eserine is entirely upon the ciliary muscle, which seems to indicate this variation to be a result of unequal action of the ciliary muscle.

7. There appears to be a definite co-ordination between the ciliary and extrinsic muscles in establishing and maintaining fixation.

I wish to take this opportunity to thank Drs. Sanford R. Gifford, A. C. Ivy, and A. J. Carlson, to whom I am specifically indebted for having given freely their opinions and observations.

9140 Exchange Avenue.

Bibliography

- ¹ Park, G. E. Arch. of Ophth., 1936, v. 15, April.
- ² Park, R. S., and G. E. Amer. Jour. Physiol., 1933, v. 104, June 1, no. 3, pp. 545-552.
- ³ Hess, C. v. Handbuch der normalen und pathologischen Physiologie, 1929, v. 12, p. 145.
- . Arch. f. Ophth., 1896, v. 42, p. 288.
- . Arch. f. Ophth., 1897, v. 43, p. 477.
- ⁴ Schaeffer. Textbook of physiology. 1896, p. 1034.
- ⁵ Peckham, R. H. Arch. of Ophth., 1934, v. 12, Oct., pp. 562-566.
- ⁶ Clark, B. C. Amer. Jour. Psychol., 1936, v. 48, Jan., pp. 82-97.

Discussion. DR. CONRAD BERENS: Have you made studies in any cases with fixed abnormal retinal correspondence?

DR. PARK: We have not used any cases except what we thought were normal fixations, because we tried to work this out from a physiological standpoint.

DR. W. B. LANCASTER: What movements do you attribute to the crystalline lens that are not explainable by the movement of the eyeballs?

DR. PARK: During our examination the visual axis remains coincident with the optic axis of the telescope (that is, from the target observed to the front of the eye). Any shift in the eyeball would move the fovea from under the image where it was primarily.

From the fact that we observe a change in this reflection and still can tell within a quarter of a degree the position of the visual axis, we would assume that the front of the eye was moving and the fovea moved at the same time and still the image would fall on the fovea. If there was not a compensatory movement within the eye, we could not recognize within

such a small degree when central fixation had been established.

DR. LANCASTER: Is it your conception that the fixation point mathematically or geometrically in the fovea is immovable or does it shift around to different parts of the fovea?

DR. PARK: If, as has been assumed, the fovea is only about two tenths of a millimeter in diameter, it probably wouldn't make very much difference.

DR. LANCASTER: Does that explain the little shift you get?

DR. PARK: Well, our shift is not only a little shift. Sometimes these angles increase from zero to 17 degrees or greater.

DR. ALFRED COWAN: Does not the angle change with the dioptric power of the eye?

DR. PARK: It might do so, because in accommodation others have observed that the relation of the pupil with the axes varies, but with our instrument, measurements are made with the fixation at infinity. The target is located at infinity. So, unless the patient was unconsciously accommodating there

would be no change in that relationship.

DR. COWAN: Would not that explain the difference during the use of eserine, atropine, and homatropine?

DR. PARK: I do not believe so, because this change goes on just the same in a normally functioning eye without the use of drugs.

DR. G. GUIBOR: Is the variation due to a change in the corneal apex? Does the variation occur in aphakic eyes?

DR. PARK: There is, no doubt, a slight variation in the curvature of the cornea, for it, being an elastic tissue, is not rigidly fixed. Other authors in their work found only a slight variation in

the curvature of the cornea during accommodation. This slight variation in the corneal curvature would not account for our observation.

In answer to the second question, there is no reason to suspect that the corneal curvature of an aphakic eye would change very differently from that in a normal eye.

DR. T. J. WILLIAMS: Does the essayist believe the lens power changes from an upright to a horizontal position? Is the lens not constant in value?

DR. PARK: I should not think the position would make any difference as to the value or the function of the lens.

OBSERVATIONS ON THE REDUCING SUBSTANCES (GLUCOSE) OF THE AQUEOUS AND VITREOUS HUMORS OF THE EYE

WILLIAM M. JAMES, M.D. AND A. J. SIEFKER, PH.D.
SAINT LOUIS

In the fasting rabbit under dial anesthesia the glucose values were: aqueous 164 mg. percent, vitreous 104 mg. percent, venous blood 137 mg. percent, arterial blood 158 mg. percent. The aqueous glucose followed closely fluctuations in the blood glucose. The vitreous glucose did not follow so closely the rise and fall of the blood glucose. Operative procedures used to relieve intraocular hypertension produced no significant alterations in the glucose values of the aqueous or vitreous. Adrenaline, eserine, or atropine applied locally to the eye produced material changes in the rate of diffusion of glucose between the blood, aqueous, and vitreous. Changes in the intraocular pressure were recorded with alterations of the blood glucose. In the normal eye no significant changes in intraocular pressure were noted following the local application of atropine, eserine, or acetylcholine. Various types of mechanical irritation of the uveal bed were followed by prompt increases in intraocular pressure. From the Department of Ophthalmology, Washington University School of Medicine. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936.

The presence of sugar in the aqueous humor of the eye was recognized by Claude Bernard in 1859, and has been verified many times by subsequent observers in a wide variety of experimental animals. It is only during the last 25 years that simultaneous comparative values have been obtained for the ocular fluids and the blood. Ask¹ found the aqueous sugar 0.01-0.02 percent greater than blood; Dieter² found the aqueous glucose 0.004 percent greater. Duke-Elder³ found the average values for the rabbit to be aqueous 0.151 gm. per 100 c.c.; arterial plasma 0.148 gm. per 100 c.c.; venous plasma 0.125 gm. per 100 c.c. After applying a correction factor to obtain values equivalent per 100 c.c. of water, the results were: aqueous 0.151 gm. per 100 c.c.; arterial plasma 0.158 gm. per 100 c.c.;

venous plasma 0.133 gm. per 100 c.c. Duke-Elder concluded that "the sugar content of the aqueous humor lies between that of arterial and venous blood." Adler,⁴ working with cats, obtained the following average for nine cats: blood 135 mg. percent; aqueous 113 mg. percent; vitreous 64 mg. percent. Adler has also shown that following quantitative changes in the blood sugar similar changes occur in the humors of the eye. Walker,⁵ working with fowls, rabbits, cats, and dogs, found that the reducing substance of the aqueous was in 14 experiments 85 percent of that of the plasma. See table 1.

Experimental

The normal glucose values of the aqueous, vitreous, and blood of rabbits. Because carbohydrate is the chief

source of body energy and disorders of carbohydrate metabolism are frequently accompanied by ocular changes, and because daily quantitative changes occur in the blood sugar following food intake, emotional stress, and fatigue, it was felt that there might possibly be some connection between the rise and fall of the sugar of the blood, aqueous, and vitreous and the maintenance of intraocular pressure.

The normal glucose values for the blood, aqueous, and vitreous of healthy

made by the Hagedorn-Jensen method as described by F. H. Adler.⁴ The values obtained by this method were 23.1 mg. percent higher than the "true sugar" values obtained by the Shaffer-Hartmann method. The findings reported are those determined by the Hagedorn-Jensen method. The average venous blood sugar was 137 mg. percent, the average aqueous sugar was 164 mg. percent, and the average vitreous sugar was 104 mg. percent. Blood from the central artery of the ear aver-

Table 1
THE GLUCOSE VALUES OF THE AQUEOUS, VITREOUS, AND BLOOD

Author	Aqueous	Vitreous	Blood		Animal
Ask	0.01-0.02% > blood				Man
Dieter	0.004% > blood				Man
Duke-Elder	mg. percent 151		Arterial plasma	Venous plasma	Rabbit
			148 mg.%	125 mg.%	
Adler	113	64 mg.%	135 mg.%		Cat
Walker			Plasma mg. percent		Rabbit
	98		118		
	148		142		
	101		145		
	165		163		
	170		164		
James and Siefker	164	104 mg.%	Arterial	Venous	Rabbit
			151 mg.%	137 mg.%	

fasting rabbits under dial-Ciba anesthesia were determined. Single samples of aqueous and vitreous were analyzed. The rabbits were not fed for 18 hours preceding the experiments. Anesthesia was induced with dial injected slowly into the marginal ear vein. This was done to avoid the wide fluctuations in the blood sugar which occur with excitement. Twenty minutes after anesthesia was induced, a sample of blood was withdrawn from the marginal ear vein. At the same time, 0.2-0.27 c.c. of aqueous was aspirated with a sharp 26-gauge needle. A vitreous specimen was obtained by plunging a 22-gauge needle into the vitreous and aspirating 0.3 c.c.

The glucose determinations were

aged 21 mg. percent above that of blood from the marginal ear vein. See table 2.

Rate of equilibration of the aqueous, vitreous, and blood. The rate of change following the administration of glucose intravenously was recorded for a series of 15 rabbits after the normal fasting, blood-sugar values had been determined. Healthy fasting rabbits under dial anesthesia weighing 2000 to 2400 gm. were used. A specimen of blood was withdrawn from the marginal ear vein; aqueous 0.2 c.c. and vitreous 0.3 c.c. were aspirated as control samples from the left eye. Then 5 c.c. of 10-percent glucose solution was injected slowly into the marginal ear vein. After stated periods of time, a second blood speci-

Table 2

GLUCOSE VALUES OF THE AQUEOUS, VITREOUS, AND BLOOD OF THE FASTING RABBIT

No.	Blood venous	Aqueous		Vitreous	
		Right	Left	Right	Left
	mg. percent	mg. percent	mg. percent	mg. percent	mg. percent
1	107	99		103	104
2	128	142	137	97	98
3	144	227	219	130	
4	138	146	144	123	118
5	145	208	203	103	102
6	137	171	165	131	121
7	160	180	168	103	100
8	144	162	150	87	88
9	139	147	164	92	92
10	127	138	153	88	88

Average Venous Blood

137 mg. %

Average Aqueous

164 mg. %

Average Vitreous

104 mg. %

men was obtained and a single specimen each of aqueous and vitreous was obtained from the right eye.

Figure 1 shows the rate of rise and fall of the glucose values of the blood, aqueous, and vitreous after the administration of a known amount of glucose, intravenously. The rise and fall of the blood and aqueous glucose are almost parallel, but there is a great lag in the rate of equilibration in the vitreous. The rapid fluctuation of the aqueous and blood sugar with the slow changes in vitreous are probably accompanied by volumetric fluid changes in the eye which influence the intraocular pressure.

The effect of various operative procedures. The influence of iridectomies, iris inclusions, and corneoscleral trephinations on the glucose of the aqueous

and vitreous was investigated. Table 3 shows the values obtained in the fasting state. A three-weeks' period of time was allowed to elapse following the operative procedure before the determinations were made. The left eye in each animal served as a control. After iridectomy of the right eye in six animals, the following average glucose values were obtained:

Blood glucose ... 127 mg. percent
 Right aqueous ... 150 mg. percent
 Left aqueous ... 148 mg. percent
 Right vitreous ... 83 mg. percent
 Left vitreous ... 84 mg. percent

In two animals following iris inclusion the values were:

Blood glucose ... 105 mg. percent
 Right aqueous ... 123 mg. percent
 Left aqueous ... 118 mg. percent

Table 3

THE INFLUENCE OF OPERATIVE PROCEDURES

Rabbits	Blood	Aqueous		Vitreous		Procedure
		Right	Left	Right	Left	
	mg. percent	mg. percent	mg. percent	mg. percent	mg. percent	
Average of 6 animals	127	150	148	83	84	Iridectomy right eye
Average of 2 animals	106	123	118	49	48	Iris inclusion right eye
Average of 2 animals	129	144	143	80	81	Corneoscleral trephining right eye

Operative procedures performed on the right eye three weeks before the determinations were made.

Right vitreous ... 48 mg. percent
Left vitreous 47 mg. percent

In two animals after corneoscleral trephinations with peripheral iridectomies, the following values were obtained:

Blood glucose ... 129 mg. percent
Right aqueous ... 143 mg. percent
Left aqueous 143 mg. percent
Right vitreous ... 79 mg. percent
Left vitreous 80 mg. percent

The rate of glucose diffusion into the aqueous chamber was compared in

three rabbits which had had a broad basal iridectomy of the right eye. The fasting animals under dial anesthesia were given 5 c.c. of a 10-percent glucose solution, intravenously, and after 30 minutes the glucose values of the right and left aqueous humors were determined. The aqueous of the iridectomized eyes averaged 207 mg. percent, of the normal eyes 216 mg. percent.

The findings indicate that the operative procedures selected did not alter the carbohydrate balance of the aque-

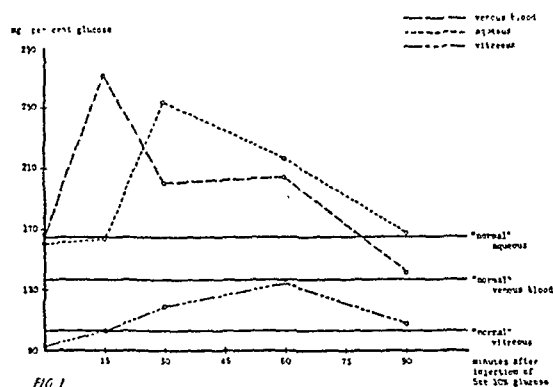


FIG 1

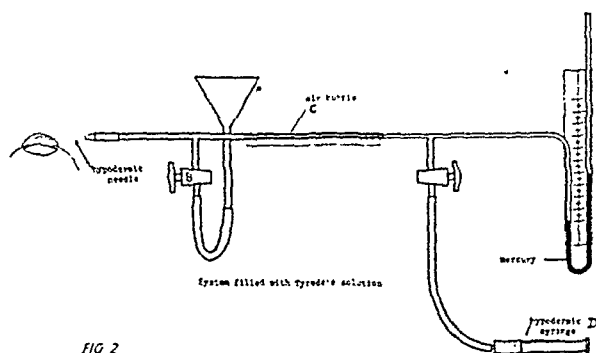


FIG 2

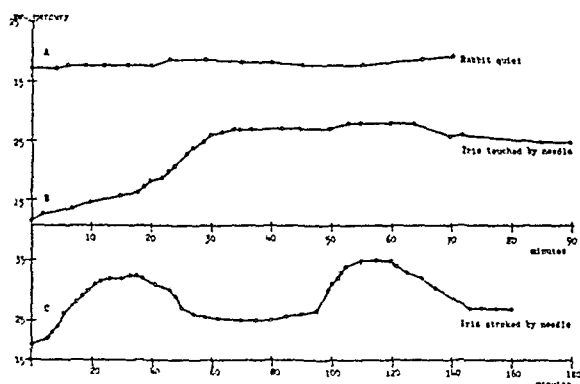


FIG 3

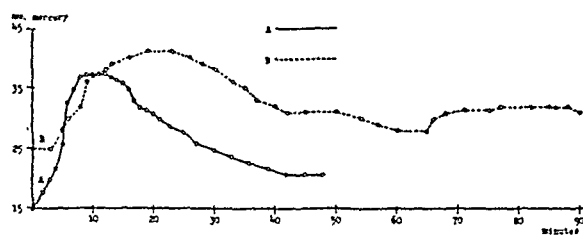


FIG 4

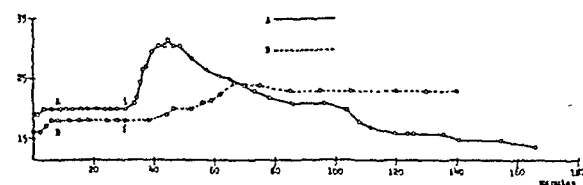


FIG 5

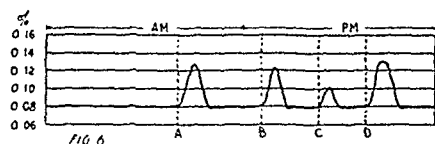


FIG 6

Fig. 1 (James and Siefker). The rate of equilibration of the aqueous, vitreous, and blood glucose.

Fig. 2 (James and Siefker). Capillary mercury manometer.

Fig. 3 (James and Siefker). Intraocular-pressure changes following iris irritation.

Fig. 4 (James and Siefker). Intraocular-pressure changes (Schiotz) following: A, hemorrhage into anterior chamber; B, pressure raised to 50 mm. and then lowered to 25 mm.

Fig. 5 (James and Siefker). Intraocular-pressure changes (Schiotz) following: A, 5 c.c. of 10-percent glucose injected intravenously; B, 1 c.c. of 1:100,000 adrenalin injected intravenously.

Fig. 6 (James and Siefker). Typical twenty-four hours' blood-glucose chart. A, breakfast; B, lunch; C, tea; D, dinner. From Cameron's Textbook of biochemistry,⁹ by permission of The Macmillan Company, publishers.

Table 4
EFFECT OF ADRENALIN CHLORIDE

Rabbit Number	Procedure	Blood Glucose		Aqueous Right before Adrenalin	Aqueous Left After Adrenalin
		Before	Thirty Minutes Later		
		mg. percent	mg. percent	mg. percent	mg. percent
1.	Received adrenalin chloride 1:1000 0.2 c.c., subcutaneously	123	203	157	157
2.	Received 1 c.c. of a 1:100,000 solution, intravenously	150	228	156	175
3.	Received 1 c.c. of a 1:100,000 solution, intravenously	154	194	164	156
4.	Received 1 c.c. of a 1:100,000 solution, intravenously	120	145	147	132
5.	Received 1 c.c. of a 1:100,000 solution, intravenously	108	127	124	132
6.	Received 1 c.c. of a 1:100,000 solution, intravenously	131	150	148	156
7.	Adrenalin-soaked pledget of cotton applied under upper lid of right eye for ten minutes	116	132	136	157
8.		148	173	162	170
	Average	131	169	148	154

ous, vitreous, and blood in the fasting state and that the loss of iris substance in the iridectomized animals did not appreciably affect the diffusion of glucose into the aqueous.

The effect of adrenalin chloride. Because adrenalin is closely associated with the carbohydrate metabolism and adrenalin hyperglycemia is a well-recognized reaction following fear or anger, and because adrenalin is used in

the treatment of glaucoma, the following experiments were performed: Adrenalin chloride was given as shown in table 4 to fasting rabbits resting quietly under dial anesthesia. Adrenalin produced a definite hyperglycemia with a rise in the aqueous glucose. This rise of the aqueous glucose was not proportionally so high as that which followed hyperglycemia without the localized vasoconstrictive effect of adrenalin, as

Table 5
EFFECT OF ESERINE AND ATROPINE

Rabbits	Blood Glucose	Aqueous		Comment
Average of 3 animals	163 mg. %	Right eserinizd 171 mg. %	Left normal 171 mg. %	Fasting animals. Right eye under eserine
Average of 4 animals	116 mg. %	Right eye eserinizd 204 mg. %		Aqueous determinations 30 min. after glucose injection
	Glucose—5 c.c. of 5% sol., intravenously. 30 min. later 210 mg. %			
Average of 3 animals	209 mg. %	Right eye atropinized 133 mg. %	Left normal	Aqueous determinations 30 min. after glucose injection
	Glucose—5 c.c. of 5% sol., intravenously. 30 min. later 350+mg. %			
			202 mg. %	

was noted when the adrenalin was applied directly to the eye.

The effect of eserine. Eserine salicylate, 0.2 percent aqueous solution, was instilled into the right eyes of rabbits three times daily for three days preceding the experiments. The values obtained in fasting rabbits are shown in table 5. Eserine in the fasting rabbit did not influence the glucose equilibrium of the two eyes. In another group of rabbits eserine salicylate, 0.2 percent aqueous solution was instilled into the right eyes three times daily for three days preceding the experiments. The blood-sugar values were obtained; then glucose, 5 c.c. of a 5-percent solution, was injected into the marginal ear vein. Thirty minutes later the blood and aqueous glucose values were determined. See table 5. The eserinated eyes equilibrated more rapidly with fluctuations in the blood-stream glucose than did the normal untreated eyes.

The effect of atropine sulphate. Atropine sulphate, 1 percent, was instilled into the right eyes of rabbits three times daily for three days before the glucose values were determined. Then glucose, 5 c.c. of a 5-percent solution, was given intravenously. See table 5. Atropine produced a general hyperglycemia in the fasting rabbit. Following the injection of glucose, intravenously, the blood glucose rose very high (out of range of the reagents being used) and there was a marked difference in the glucose values of the aqueous of the two eyes. The atropinized eyes equilibrated with the blood much less rapidly than the normal eyes.

Intraocular-pressure determinations. The intraocular pressure of normal fasting rabbits under dial-Ciba anesthesia was determined. For this purpose a capillary mercury manometer was used (see figure 2). The intraocular tension was determined by the Schiötz tonometer. The pressure in the manometer system was elevated to the level indicated by the tonometer by varying the height of the reservoir of Tyrode's solution, which was connected in funnel A. A small cut was made through the anterior two thirds of the cornea with a

Graefe knife. Then with fluid running through the needle at the known pressure the needle was inserted into the anterior chamber on the plane shown. Stopcock B was then closed and a small bubble, C, brought back to the initial point in the system by altering the volume of fluid in the system by manipulating the syringe, D. After some practice it was possible to carry out the pressure determinations without losing aqueous or inducing any change in the size of the pupil. We found that if the iris was touched or aqueous lost, wide pressure variations were obtained. Figure 3, A, shows the type of pressure readings that were obtained when the rabbit was resting quietly under anesthesia. Figure 3, B and C, indicated a rise in intraocular pressure after the iris was lightly stroked with the tip of the needle in the anterior chamber. Figure 4, A, was obtained after the aqueous had been allowed to escape and the pressure then brought back to the initial level. There was a slight escape of blood into the anterior chamber and with this there was a marked rise in the intraocular pressure. Figure 4, B, was obtained after the pressure in the eye had been elevated to 50 mm. of mercury for two minutes after insertion of the needle and then lowered to 25 mm. Again there was a marked rise in intraocular pressure. Figure 5, A, demonstrates the effect of glucose, 5 c.c. of a 10-percent solution, given intravenously. There was a rather marked rise of pressure followed by a slow decline to a subnormal level. Figure 5, B, shows the effect of adrenalin, 1 c.c. of a 1:100,000 solution, injected slowly intravenously.

Discussion

The daily normal variations in man of the blood-glucose level are well shown in a chart taken from Cameron's text-book of Biochemistry (fig. 6). By altering the blood-glucose values in rabbits by giving glucose intravenously or by producing an adrenalin hyperglycemia, it is possible to alter the glucose values of the aqueous and vitreous. With the increase in osmotic pressure

of the aqueous induced by the rapid fluctuations of the aqueous and blood glucose in coming into equilibrium, an osmotic-pressure difference is created between the aqueous and the vitreous with the tendency on the part of the relatively concentrated aqueous to abstract fluid from the vitreous, which has a much lower glucose value. The operative procedures in common use for the relief of glaucoma, namely, iridectomy and various types of filtration operations, apparently do not materially influence the glucose level of the aqueous or vitreous in relation to the blood glucose in the fasting state. The action of the miotic, eserine, is such that the normal glucose level of the aqueous is not altered; yet it facilitates the diffusion of glucose into the aqueous from the blood stream. Atropine apparently impedes the diffusion of glucose from the blood into the eye.

The close relationship between the intraocular pressure and the state of the capillary bed of the uveal tract is shown in the graphs obtained following trauma to the iris. Slight iritic irritation may produce a sharp rise in intraocular pressure; or a rise in intraocular pressure (fig. 3) may be followed by a subsequent rise in pressure. This has been explained as a vascular crisis by Duke-Elder and offered as a factor in the production of an acute glaucomatous attack.

Conclusions

1. In fasting rabbits under dial-Ciba anesthesia the blood sugar averages 137 mg. percent, the aqueous sugar 164 mg. percent, and the vitreous sugar 104 mg. percent.

2. Changes in the glucose level of the blood are reflected after a lapse of time in the intraocular fluids. An increase in the glucose content of the aqueous increases the osmotic pressure in the anterior chamber, and with the subsequent fall of the blood-sugar level the accumulation of glucose in the aqueous causes the inflow of fluid into the anterior chamber with a subsequent rise in intraocular pressure. The relatively lower osmotic pressure of the vitreous humor facilitates the passage of fluid from the posterior to the anterior segment of the eye.

3. Eserine increases the rate of the diffusion of glucose into the aqueous of the eye.

4. Atropine retards the diffusion of glucose into the aqueous humor of the eye.

5. Irritation of the vascular bed of the uveal tract is associated with wide fluctuations in intraocular pressure. These fluctuations are due to vascular dilatation or constriction and also to alterations of the permeability of the capillary membrane.

640 South Kingshighway.

Bibliography

- ¹ Ask, F. The sugar of the aqueous humor of man. *Bioch. Zeit.*, 1914, v. 59, pp. 35-62.
- ² Dieter, W. The relationship between osmotic pressure, blood pressure, especially capillary pressure, and intraocular pressure. *Arch. f. Augenh.*, 1925, v. 96, pp. 197-264.
- ³ Duke-Elder, W. Stewart. The nature of the intraocular fluids. *Brit. Jour. Ophth.*, 1927, Monograph Supplement No. 3.
- ⁴ Adler, F. H. An investigation of the sugar content of the ocular fluids under normal and abnormal conditions, and the glycolytic activity of the tissues of the eye. *Trans. Amer. Ophth. Soc.*, 1920, v. 28, p. 307.
- ⁵ Walker, A. M. Comparison of the chemical composition of the aqueous humor, cerebro-spinal fluid, lymph, and blood from frogs, higher animals, and man. *Jour. Biol. Chem.*, 1933, v. 101, p. 269.
- ⁶ Cameron, A. T. *Textbook of biochemistry*. Ed. 4, New York, The Macmillan Company, 1933, p. 317.

KERATOCONJUNCTIVITIS WITH ADENITIS IN CALCUTTA

SARADINDU SANYAL, M.B.
CALCUTTA, INDIA

A detailed description of the various forms of an ocular affection manifesting protean appearances is given, together with the differential diagnosis from trachoma, vernal conjunctivitis, angular conjunctivitis, and follicular conjunctivitis.

A form of keratoconjunctivitis with adenitis is described which has probably been in existence for a long time but of which no adequate description has been found. It occurs in the following forms:

Acute. In the acute forms, if the case is mild, there is hyperemia of the upper and lower palpebral conjunctivae with a sensation of foreign body in the eye, or slight itching and lacrimation. The lids are more or less swollen with scarcely noticeable discoloration. On everting the upper lid, either at the inner or outer angle and at the junction of the tarsal conjunctiva with the fornix, small areas more hyperemic than the rest and slightly elevated are visible in which one or two deeply situated, yellowish pinpoint areas may be seen, surrounded in many cases with small granules about the size of a pinpoint. In some cases, several more superficial areas are seen at these sites. A discharge is either not noticed by the patient or is very slight.

In some more acute forms the lids are discolored, assuming a more or less dusky hue. The veins become more prominent. There may be complete obliteration of the fronto-orbital fissure, the upper lid overhanging the lower lid to a certain extent. The lid margins may be reddened and this discoloration may extend for about 2 or 3 mm. In some cases there is excoriation of the lid margins along the whole border, especially at the angles. These lid symptoms are more common in children and young women than in adult males. The bulbar conjunctiva is injected, either completely or the injection may end at a certain distance from the cornea. Sometimes there is chemosis, but it is never great. Essential lesions are seen in the upper and lower palpebral conjunctivae and take the following forms:

(1) Deeply seated pinpoint areas, surrounded by granules, at the inner and outer angles. (2) There may be several irregularly shaped yellowish superficial areas, varying from 1 to 3 mm. in diameter, separated from one another by reddish normal conjunctiva. Such areas are more common in the retrotarsal fold. (3) The whole of the conjunctiva may be studded with pinpoint, deeply situated, yellow spots, surrounded by a reddish-yellow area. (4) Sharply limited irregularly shaped yellow areas may be surrounded by dilated blood vessels which never cross it. (5) There may be a combination of the three. (6) The lower lid may show granules resembling follicular conjunctivitis. (7) Occasionally, on the lower tarsal conjunctiva, a bleblike area more or less quadrilateral in shape may be seen. This area is raised from the other portion of the conjunctiva and is highest near the lid margin, gradually merging with the fornix. It is generally 5 or 6 mm. in the anteroposterior diameter and 2 or 3 mm. in breadth. The color is partly yellow and partly red. They are seen in moderately severe cases. (8) Localized areas of necrosis surrounded by edema and intense congestion are occasionally seen on the bulbar conjunctiva. In such cases the yellowish spots are on a lower level than the other portions of the conjunctiva and the whole of the bulbar conjunctiva is injected. (9) Localized noninflammatory edema of the bulbar conjunctiva, most conspicuous in the upper and lateral quadrants, is seen when the yellow spots are on the upper external commissure. These edemas are painless, which distinguishes them from the edema due to styes or chalazion.

Discharge is rare or scanty, in most instances, but a whitish discharge may collect at the inner angles and excoriate the skin.

Subconjunctival hemorrhages of the bulbar and upper palpebral conjunctiva occur. Those of the latter are more common and occur in the form of circular or flame-shaped areas along the course of the dilated capillaries. These hemorrhages are more common near the yellowish areas although when there is intense congestion they may occur elsewhere. Hemorrhages under the bulbar conjunctiva are less frequent but are occasionally seen, especially in children.

Glands involved. Generally the preauricular gland is enlarged. The increase in size is almost inversely proportional to the age of the patient. The gland is generally slightly tender to pressure and the skin over it is mobile. Skin sensitiveness is seen oftener in females and children. Redness of the skin over the gland with suppuration of the gland also occurs but is very rare. Earache in connection with the glandular involvement has been noted.

Number of eyes affected. Monocular affection is as common as the involvement of both eyes; the latter occurs either simultaneously or within a few days' interval. Sometimes during the convalescence of one eye the other becomes involved. The bilateral affection in children sometimes makes it difficult to distinguish from acute conjunctivitis.

Constitutional symptoms. There is generally freedom from constitutional symptoms in the adult. In adolescent girls, occasionally, a rise of temperature may occur. In children under five years of age, there is a slight rise of temperature (99 to 100° F.) with coated tongue and constipation, although apyrexal cases are not rare. Very rarely, enlargement of the spleen and liver with jaundice may occur. In infants under six months of age, death may supervene.

The onset may be heralded by (1) no symptom, or when it has progressed to a certain stage, the heaviness of the lids and redness of the conjunctiva may attract the attention; (2) sensation of a foreign body generally at one or the other angle in the upper lid where the essential lesions are found. Apparently this is due to the dilation of the local blood vessels; (3) an intense itching

sensation without an awareness of anything having befallen the eye.

Symptoms complained of are (1) a burning sensation which may be constant or periodic occurring at certain hours of the day; (2) itching, which may be occasional or incessant and so intense as to give no peace. This itching is characteristic and when present at once points to the diagnosis, even in the bilateral cases with discharge; (3) photophobia; (4) pain.

Involvement of the cornea occurs in the acute and subacute forms and the bulbar conjunctiva is always affected. The changes in the cornea are: (1) oily appearance of the cornea without a definitely localized lesion; (2) superficial keratitis in one of the following forms: a. Punctate—already described in a previous communication (Amer. Jour. Ophth., 1933, August, p. 750). Briefly, the whole cornea is studded with superficial roughly circular punctate areas. b. Disciform—a centrally situated white area the depth of which may lie between the epithelium and Bowman's membrane or deeper unaccompanied by vascularization. c. Interstitial—diffuse haziness of the cornea unaccompanied by vascularization. d. Irregular areas scattered on the cornea. e. Linear—situated anywhere on the cornea. f. Ulcerations, such as (i) loss of superficial epithelium of a portion of the cornea, causing loss of luster; (ii) sickle-shaped ulcer near the margin; (iii) single punctiform ulcer situated either at the margin or at a slight distance from it, sometimes accompanied by superficial vascularization from the conjunctiva; (iv) areas of necrosis situated anywhere on the cornea; the necrotic mass of cornea, cheesy in appearance, comes out easily when lightly touched with a cotton-wool swab, and the process of degeneration, if it penetrates deeply, may cause perforation and prolapse of the iris; sometimes the whole cornea is sloughed out. The progress is generally slow; panophthalmitis due to perforation has not been seen; (v) hypopyon ulcer without any undermining of the edge of the progressive margin.

Vascularization sometimes occurs with-

in a few days of the onset of acute symptoms and as early as on the third day is observable with the corneal microscope as vascular loops just crossing the limbus. This may not occur over the whole of the upper limbus but only at certain points. Generally, it occurs in the subacute forms. This vascularization is preceded by infiltration as in trachoma; it generally begins at the upper quadrant and may cover the whole cornea.

Chronic. This is one of the most common forms in Bengal and is almost always bilateral. It may be classified into the following distinct types: (1) Chronic conjunctivitis, with the following symptoms: a slight discharge, lacrimation, frequent recurrence of the subacute forms, a burning sensation, chronic photophobia, and so forth. (2) Vernal conjunctivitis, characterized by swelling and the gelatinous appearance of the cornea at certain points at the limbus or completely surrounding it, accompanied by intense itching, photophobia, lacrimation, and swelling of the preauricular glands. On everting the lids yellow spots are seen. (3) Angular conjunctivitis, manifesting erosion of the epithelium at the angles with a velvety appearance of the palpebral conjunctiva. (4) Trachomatous, in which when pannus develops on the cornea it is indistinguishable from that of trachoma and, accompanied by hypertrophied papillae, the picture of trachoma is complete. The lid, however, is not thickened and no other complications of trachoma are found. (5) Follicular, manifesting irregularly distributed follicles with little or no discharge. (6) Chalazion type, in which fairly large tumors are seen which are distinguished from the ordinary type by their general location near one side. The mouth of the chalazion is surrounded by numerous yellowish areas with no signs of acute inflammation at any stage of its development.

Appearance of yellow spots in chronic forms

The bulbar conjunctiva is generally free from any injection. The palpebral

conjunctiva may show: (1) Small deeply situated yellow dots at either the medial or the outer side of the tarsal conjunctiva with localized congestion and small granulation. (2) Superficial areas of yellow spots irregular in shape and free from any blood vessels, also separated from one another by normal conjunctiva. These are especially seen in the retrotarsal folds and the upper end of the tarsus. (3) Two or three yellow spots about 2 or 3 mm. in diameter and encircled by dilated blood vessels which separate them from the normal conjunctiva.

Pigmentation of the conjunctiva

This is generally in the upper palpebral conjunctiva and is common in chronic cases, especially in old people and occasionally in children. It may occur anywhere on the tarsal conjunctiva, generally in small groups. There may be a diffuse area of pigmentation, measuring 3 to 4 mm., occasionally linear in type, beginning at the medial and proceeding to the lateral side in the form of a band.

Differential diagnosis

The monocular type does not present much difficulty. The bilateral type, however, is to be distinguished from other types of conjunctivitis, in that its objective signs are out of proportion to the symptoms, yellow spots, and scanty discharge, as follows:

Trachoma: absence of true granulation, scarring, and complications.

Vernal conjunctivitis: glandular enlargement and yellow spots, if present.

Angular conjunctivitis: Excoriation of the angles with glandular enlargement and yellow spots is not very rare and may make it difficult to diagnose. In such cases the presence of yellow spots and glandular enlargement settles the diagnosis.

Follicular conjunctivitis: The subacute forms are easily distinguished by the essential lesions. Acute Koch-Weeks conjunctivitis may supervene upon chronic types. The copiousness of the discharge and the smear preparations settle the diagnosis.

Prognosis

If the cornea is not affected, acute symptoms are cured under treatment in two to four weeks. The involvement of the cornea makes the prognosis graver, but unless the cornea is severely affected, the prognosis as regards vision is quite good. Recurrences with corneal involvement, either in the nature of superficial punctate keratitis or with small erosions, are not rare. In simple keratitis, the vision is not much affected except temporarily; in recurrent ulcers, the vision becomes poorer. In very old people and in very young children, since there is danger of extensive ulceration, the prognosis should be guarded. Chronic types with no symptoms do not contraindicate intraocular surgery.

Course

Unless adequately treated the disease may run for years in a subacute or chronic form with seasonal affections. Cases have been seen in which there was a history of an acute attack for ten to twelve years. In chronic forms it may run for years and is especially seen in old people.

Treatment

If the yellow spots are not numerous the best treatment for the acute forms is excision. If there are numerous yellow areas, either 0.25-percent iodine in glycerine, once a day after cocainization, or zinc, alum, and methylene-blue drops and yellow ointment are best. In acute cases, intravenous injection of an aqueous solution of iodine does much good. In chronic cases glycerine and tannic acid (2 percent) is good. If there is much itching, calcium gluconate in dram doses may be given. In cases of keratitis, if the spots are not numerous nor extensive, touching the points with tincture of iodine causes a quick disappearance of the keratitis. Ulcerations of the cornea respond to bismuth subgalate (gr. v) together with hydrargyri oxidum flavum (gr. .5), cocaine alkaloid (gr. ii) and vaseline (dr. iv) in the form of an ointment. For pannus, the excision of a small piece of the superficial portion (about 2 mm.) of the cornea

near the limbus causes its quick disappearance.

Epidemiology

The age of affected individuals ranges from 3 months to 70 years. Chronic types have been seen in children over 5 years of age and are very common in people over 50 years.

Sex: Both sexes seem to be equally affected.

Eyes: No special predominance of either side has been noted.

Histopathology

Method of collecting the material. The eye was thoroughly washed with warm normal saline after cocainization with a few instillations of a five-percent aqueous solution of cocaine hydrochloride.

(1) For smear preparations, the upper lid was everted and the epithelium scraped by means of a sterile cataract knife. The slides taken were fixed by heat, methyl alcohol, and Schaudin fluid for Gram's, Giemsa's, and iron hematoxylin stains.

(2) For sections of the conjunctiva, a small piece of tarsal conjunctiva was excised, including the yellow spots, and fixed in Bounin's fluid. Paraffin sections were made.

(3) For sections of the cornea, a small piece of the cornea about a millimeter in breadth and including a small portion of the substantia propria was shaved off by means of a cataract knife, about a millimeter from the limbus. In very acute cases no sectioning was done; subacute, chronic, and mild forms were sectioned for study. After sectioning, the wound was touched with tincture of iodine and bandaged for 12 hours. Tissues were fixed in Bounin's fluid, and several paraffin sections made.

Smear preparations. The Gram-stained preparations showed the bacteria to be small cocci varying in size from 0.25 μ to about 5 μ in diameter, either free or lying within the cells.

The Giemsa-stained slides showed cocci stained reddish blue and slightly alcohol fast (about 1 sec.). The appearance of the epithelial cells by Giemsa stain varied according to the amount of infection in each cell. Sometimes the

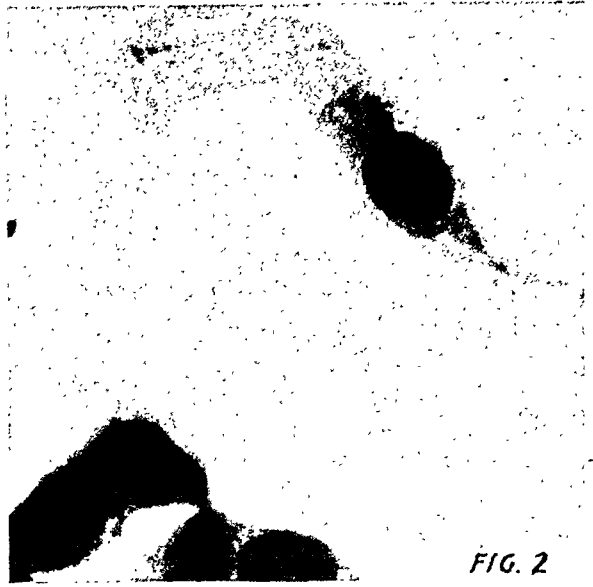


FIG. 2

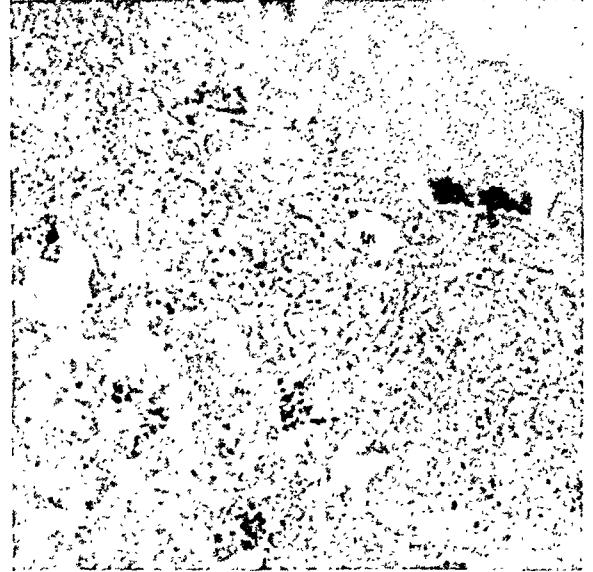
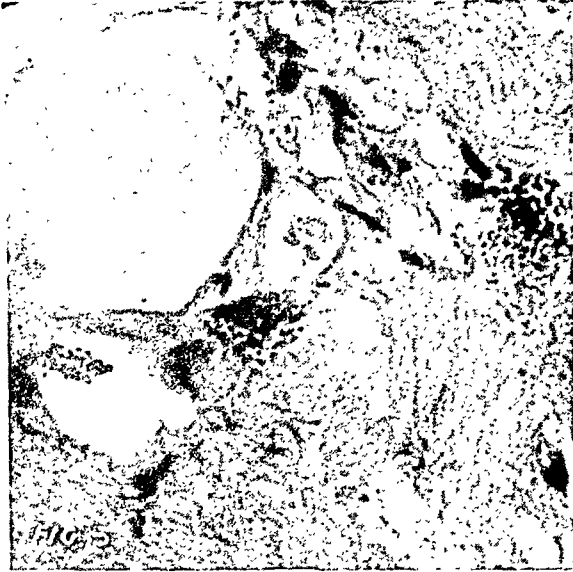


Fig. 1 (Sanyal). Shows a small area of degeneration extending to the surface which appears clinically as yellow spots.

Fig. 2 (Sanyal). Epithelial cells stained by iron hematoxylin; several cocci are seen above. Below the cell on the right hand shows an homogeneous black mass lying on the cell (smear preparation). $\times 1600$.

Fig. 3 (Sanyal). Section of the conjunctiva showing several groups of cocci lying free or in the cell in the subepithelial layers. $\times 1010$.

Fig. 4 (Sanyal). Section of the cornea looking like spring catarrh. Note several groups of cocci in the substantia propria and also several single cocci. The papillary hypertrophy and swelling of the epithelium are also seen. $\times 610$.

Fig. 5 (Sanyal). Section of the cornea showing pannus. An endothelial leucocyte is seen lying within the capillary which has taken on a granular appearance. Outlines of epithelial cells are indistinct owing to partial degeneration.

whole cell was dotted with red-stained bacteria and in other cases the distal end was reddish and swollen with numerous cocci within the area. Where three or more cells were grouped together, each cell was seen to be surrounded by a red border. In other cells some red dots were seen to have crossed the border line and entered the protoplasm. In no case were bacteria seen to have attacked the nucleus, which retained its shape and size till the whole cell began to show signs of degeneration. Giemsa stain gave the best view of the cocci.

In iron hematoxylin preparations several manifestations appeared: (a) homogeneous black areas of different shape and size lying in different portions of the protoplasmic area with no distinct cocci visible; (b) black areas and black-stained cocci; (c) the whole protoplasm studded with black dots.

Sections. The cellular elements were chiefly plasma cells, mononuclear leucocytes, and endothelial cells of which plasma cells formed about 90 percent. Endothelial leucocytes were more numerous in the subepithelium. The epithelial cells were most affected and were found to be in different stages of degeneration reacting faintly to the stain but still retaining the cellular outline. Vacuolation, either partial or complete, and loss of cell structure were found scattered everywhere in the epithelium. In some places groups of cells were seen to have undergone a fatty degeneration surrounded by more or less healthy cells. In other places islands of healthy cells were seen lying in an area of extensive degeneration. When the degenerated areas lay more superficially, they appeared as yellow spots clinically (figs. 1 and 2).

Papillary hypertrophies are common in acute and subacute cases. In a few cases follicle formations were seen.

Repeated minute sectioning of the tarsal conjunctiva stimulates the formation of the fibrous tissues and disappearance of the cocci from the tissues, although the papillae and the follicles may not disappear at the same time. Fibrous-tissue growth is not a feature in these cases, even in the subacute

and chronic forms. In chronic cases the degenerative changes are the same, but cellular infiltrations are of a milder character. In old cases pigment was seen. In this layer the cocci were seen as minute dots within the epithelial cells or endothelial leucocytes or free in the degenerated area.

The subepithelial layer took the stain more brightly and the different cellular elements were distinctly recognizable. The large endothelial leucocytes were seen to be heavily infected so that they took on a dotted appearance. Some of these burst and became disintegrated so that a group of bacteria was observed lying free partly surrounded by it. In some places no trace of any leucocyte was seen, and the cocci were free in this layer (fig. 3). In the glandular layer, they were found within the lymphatic glands either infecting the cells or lying free in the lumen. Sections stained by the iron-hematoxylin method showed in addition some endothelial leucocytes which were partially stained a homogeneous black. The coccus in the epithelial cells was considerably smaller than in the subepithelial layer.

In sections of the cornea, round-cell infiltration predominated and here also the epithelial layer was chiefly affected, the substantia propria less so, as evidenced by the staining reactions. The epithelium showed varying degrees of degeneration. In places the cell outline was indistinct. The cocci were found within the epithelial cells and free in areas of degeneration. A few polymorphonuclears were also seen. Cocci were likewise found in the substantia propria either free or in groups (fig. 4).

In pannus, the blood vessels were found within the epithelial layer and did not penetrate the substantia propria. In association with vascularization, the cocci were found in the epithelial layer and substantia propria. Occasionally endothelial leucocytes were found in the blood vessels containing the cocci (fig. 5). In pannus the cellular infiltration is not great. In cases which clinically looked like spring catarrh, there was, in addition to infiltration and invasion by the cocci, papillary hyper-

trophy and edema of the epithelium of the cornea at the sclerocorneal junction on its inner side (fig. 4):

Summary

A form of keratoconjunctivitis with adenitis is described which in its protean manifestations resembles many known diseases of the conjunctiva and cornea with which it has been confused but which bacteriologically is shown to be the same disease.

Pannus in a case of conjunctivitis in man is regarded by most authorities as the strongest evidence that the disease is trachoma. In guinea pigs and rabbits a form of conjunctivitis with pannus occurs naturally; it has also been experimentally reproduced. This pannus differs from the pannus of hypersensitivity in being unable to produce cur-

tain pannus.¹ The disappearance of the bacteria by small tarsiectomies, whereas clinically the granules persist, and the production of greater amounts of fibrous tissue raise an interesting point in trachoma, that probably many cases are spontaneously cleared of bacteria although clinically the signs persist.

It will be seen that the corneal affections are different from the epidemic superficial keratitis² which has been described previously. The monocular phase formed the subject matter of another paper.

In conclusion my best thanks are due to Dr. H. N. Ray, protozoologist, University of Calcutta, for the excellent photomicrographs and many helpful suggestions.

19 Hari Ghosh Street.

References

- ¹ Morris, M. C., and Julianelle, L. A. A study of an ocular infection induced experimentally with *Bacterium monocytogenes*. Amer. Jour. Ophth., 1935, v. 18, p. 535.
² Sanyal, S. Epidemic superficial keratitis. Amer. Jour. Ophth., 1933, v. 16, May.

ORTHOPTIC TREATMENT OF STRABISMUS

J. L. BRESSLER, M.D.

HOUSTON, TEXAS

Orthoptic treatment for the correction of strabismus has begun to assume such importance that a knowledge of its methods and routine is becoming increasingly necessary as a part of the equipment of the ophthalmologist.

Orthoptic treatment is frequently useful not only in correcting strabismus as the only means employed, but also in combination with surgery, when it commonly leads better results than surgery alone.

Cases must be carefully selected for this method of treatment; it has definite limitations, is not a cure-all. From the orthoptic clinic of the Illinois Eye and Ear Infirmary. Read before the Chicago Ophthalmological Society, February 17, 1936.

The value of orthoptic treatment has of late been assuming much importance in the daily routine of many ophthalmologists. In this paper the details of routine, methods, and instruments used will be omitted. These were fully discussed in a paper presented by the writer before the Illinois Medical Society last spring and published in the September, 1935, edition of the Illinois Medical Journal. It is intended, however, to consider the subject in a general manner, evaluating not only the usefulness of orthoptic treatment in correcting strabismus without operation but also its extreme usefulness and almost absolute necessity following surgery.

A word of warning and advice will not be out of place at this point: It would be well not to expect every case of strabismus selected for orthoptic treatment to respond rapidly and end in a cure; for disappointment with the treatment, and certainly with the results will follow. To anticipate good results, favorable cases must first be selected. In our clinic the selection of cases is guided by a set of restrictions pointed out in the aforementioned paper.

The management of the actual treatment presents many difficulties. The question arises as to whether the orthoptic treatment should be personally administered by the ophthalmologist or whether the technical part of the work should be delegated to an assistant or technician trained for it. If the ophthalmologist intends to do any orthoptic training in his office and expects to get results, he must have a complete knowledge not only of the routine and meth-

ods of the treatment, but also of the physiology and mechanics of the various ocular muscles involved. Orthoptic treatment is time-consuming and requires considerable patience. To be a very good ophthalmologist does not necessarily make one a good orthoptician. In my opinion the actual work of training the patient should be delegated to a technician carefully and thoroughly trained to do this work. The role of the ophthalmologist should be that of director and supervisor. He should be the one to indicate the type of treatment the patient is to receive; the selection of treatment should not be left to the technician. He must thoroughly understand every step and phase of the problems encountered in the orthoptic treatment of strabismus or his efforts will result in failure.

It has been my good fortune to be associated with an institution where large numbers of strabismus patients are cared for each year. Due to this fact, it has been possible to compile a large number of cases exemplifying the various groups for comparison. In the study of these cases, it was found that they could best be considered under three categories, as follows: Group 1. Cases in which surgery was performed, but no orthoptic treatment given either before or after the operation. Group 2. Cases in which surgery was performed, orthoptic treatment having been given only after the operation. Group 3. Cases in which surgery was performed, and orthoptic treatment given both before and after the operation.

The data for these groups are tabulated in tables 1, 2, and 3, respectively.

Although the few comparative fig-

Table 1

GROUP 1. SIXTY-FOUR CASES. SURGERY NOT COMBINED WITH ORTHOPTIC TREATMENT

Deviation		Fusion	
Straight	22	None	58
Undercorrected, 1-15°	19	3d degree	1?
Undercorrected, over 15°	11	2d degree	1
Overcorrected	12	1st degree	4

Table 2

GROUP 2. FIFTY-NINE CASES. SURGERY FOLLOWED BY ORTHOPTIC TREATMENT

Deviation			
Before Treatment		After Treatment	
Straight	5		16
Undercorrected	35		24
Overcorrected	19		19
Fusion			
None	50		38
3d degree	13		12
2d degree	0		3
1st degree	6		6

Table 3

GROUP 3. FORTY CASES. SURGERY COMBINED WITH ORTHOPTIC TREATMENT BEFORE AND AFTER THE OPERATION

Deviation			
Before Operation 18° to 40°		After Operation	
		Straight	17
		Undercorrected, 1-15°	16
		Undercorrected, over 15°	5
		Overcorrected	2
Fusion			
None	24	None	11
3d degree	3?	3d degree	12
2d degree	2	2d degree	3
1st degree	11	1st degree	14

ures just presented do not indicate very high percentages, they are nevertheless striking when the type of patients and parents dealt with at our free clinics is taken into consideration. The mentality and coöperation of the children are low, that of the parents even lower. In private practice results should be very much better, and usually are.

An analysis of the figures presented in the table makes apparent at once the

influence of orthoptic treatment on the end results. Of the patients treated before and after surgery, nearly 40 percent gave evidence of some degree of fusion before operation, and nearly 75 percent had some degree of fusion after operation. These observations were made only a short time after the operations and are not final. Since then, many of the patients without fusion and many with a small degree of fusion have de-

veloped full fusion with stereopsis. Many of the others will show greater improvement in time. The influence of orthoptic exercise can also be demonstrated in the cases in the second group. With treatment after surgery 11 more were straight and 12 more had developed fusion.

The following three case reports illustrate some of the work to which reference has been made:

Case 1. C. C., aged three years, came to us on November 27, 1933, with a history of having had squint for the past 15 months. She had worn glasses since the onset of squint.

There was an alternating esotropia, the deviation with glasses being 10 degrees, without glasses 15 degrees. Vision in the right eye was 20/25, in the left eye 20/30. With glasses, O.U. +1.25 D. sph., vision was 20/20 in each eye. Fixation and motility were good. As to fusion, at times there was superposition of objects.

On December 9, 1933, daily orthoptic treatments were begun. By March 26, 1934, there was no deviation, some evidence of esophoria being present. Fusion of all grades with stereopsis had been developed. Vision was now 20/20-1 in each eye. No glasses were worn.

Comment: This is a case of corrected strabismus with elimination of the deviating angle and development of fusion without recourse to surgery.

Case 2. O. B., aged 28 years, was admitted to the orthoptic clinic on February 11, 1935, with a history of having had eyes that turned in since she was four years old. She had never been treated for the condition and had never worn glasses.

There was an alternating esotropia of 30 degrees. Vision was O.D. 20/30, O.S. 20/25. With a correction of O.D. +0.75 D. sph., O.S. +1.00 D. sph. vision was improved to 20/20 for each eye. No glasses were prescribed. Motility and fixation were good.

Orthoptic treatment was instituted but abandoned on March 29th, because there was no improvement. On that day the right eye was operated upon, a re-

cession of the internal rectus with resection of the external rectus being performed. On April 17, 1935, the eyes were parallel, and orthoptic treatment was resumed. By April 29th, simple fusion had been developed. Now all grades of fusion with stereopsis and parallelism are present.

Comment: This case illustrates a strabismus corrected by means of surgery, and development of fusion after the operation by means of orthoptic exercise.

Case 3. J. J., aged seven years, came to us on February 12, 1934, because of eyes that had turned in since she was four years old. Glasses had been worn for the past two years, and for the last year she had had orthoptic treatment elsewhere.

There was an alternating esotropia. The deviation with glasses was 26 degrees, without glasses 35 degrees. Vision was 20/25 in each eye. With the glasses she was wearing, O.D. +4.75 D. sph. \approx +2.00 D. cyl. ax. 180°, O.S. +5.25 D. sph. \approx +2.00 D. cyl. ax. 180°, vision was 20/20 in the right eye and 20/25 in the left eye. Fixation and motility were good. Fusion was absent.

Orthoptic treatment was instituted and continued for several weeks but during this time the eyes showed a tendency to become worse, the angle at times being as high as 45 degrees.

On April 27, 1934, the left eye was operated upon. A recession of the internal rectus with a Reese resection of the external rectus was performed. On May 21st, the remaining deviation varied from 4 degrees with glasses to 20 degrees without glasses.

Orthoptic treatment was started about two weeks after the operation. On August 27, 1934, the eyes were parallel with and without glasses. Fusion of all grades including stereopsis is now present. With glasses vision is 20/15 in both eyes.

Comment: This is an example of a case of corrected strabismus in which surgery was performed, resulting in a marked undercorrection. Orthoptic treatment precluded the necessity of further surgery.

Conclusion

The data presented tend to show that orthoptic treatment should not be judged by its percentages of cures of strabismus with nonoperative treat-

ment alone, but should also be considered for its value both before and after surgical correction for deviation.

1328 Medical Arts Building.

VISUAL TASKS IN SIGHT-SAVING CLASSES

MATTHEW LUCKIESH, PH.D., AND FRANK K. MOSS, PH.D.
CLEVELAND

The classification of low-vision subjects by the criterion of visual acuity may result in serious inconsistencies with respect to the actual visual efficiencies of the individuals. Visibility measurements are fundamentally sound and provide knowledge of broader significance and greater practical value. From the Lighting Research Laboratory, General Electric Company.

The sight-saving class presents an appealing opportunity for increasing visual efficiency and ease in seeing through (1) the correction of ocular deficiencies, (2) the provision of adequate light and proper lighting, and (3) the regulation of visual tasks in accordance with the visual ability of the subject. These are the controllable phases of seeing and, in this case, the restrictions upon complete control which are often imposed by so-called practical considerations are reduced to a minimum. The present discussion pertains largely to the third controllable phase, in so far as it is possible to separate these intimately interrelated factors. Obviously, such a separation is chiefly an expedient of discussion.

Since it is reasonable to assume that reading constitutes the major critical visual task in the classroom, the discussion is further restricted to this task. The textbooks used in sight-saving are commonly printed in either 18-point or 24-point type and upon non-glossy white paper. Thus the physical characteristics of the important visual tasks performed by the pupils are definitely describable and hence subject to quantitative analysis. Furthermore, it may be stated that there is no general agreement as to the size of type best suited to the needs of the sight-saving pupils. It is probable that the problem of optimum type-size has been complicated by economic considerations. For example, the cost of books printed in 24-point type is said to be about three

times as great as that of books printed in 18-point type. Such a differential in cost is significant only when it is compared to the differential in ease of seeing in the two cases. Obviously, ambiguity in the latter overemphasizes the importance of the former. In general, economic factors have not been considered in the present discussion of optimum type-size.

The subjects for this investigation included 72 pupils in the seventh, eighth, and ninth grades of sight-saving classes located in four different schools. Ten adult subjects possessing normal or near-normal vision were also used in order to permit the appraisal of the results obtained upon an absolute basis as well as upon a relative one. Type-size, as a factor in seeing, was appraised by visibility measurements made with the Luckiesh-Moss Ophthalmic Sensitometer.

This instrument¹ (fig. 1) consists essentially of two colorless photographic filters with precise circular gradients of density which may be rotated simultaneously in front of eyes looking at an object or performing a visual task. The observer holds the instrument in approximately the same position that eyeglasses are worn, and with the right hand slowly turns a disc that rotates the circular gradients until the visual threshold or limit in the performance of the visual task is reached. The procedure is quite similar to that employed in operating a visual photometer. Individual measurements of visibility

may be made in a few seconds even by untrained observers. Obviously, the reliability of the appraisals of the relative visibility of various objects is proportional to the number of observations involved; assuming, of course, that obvious precautions are exercised.

The gradient filters not only reduce the apparent brightness of the visual field due to absorption, but also lower the contrast between the object of re-

adaptation is a function of the density of the filters before the eyes. Since this variable is present in both the calibration and the use of the instrument, it does not introduce differential effects in the measurement of relative visibility. The range of our standard visibility meter is designed for everyday seeing conditions indoors in the daytime and under artificial lighting at night.

A fundamental characteristic of the

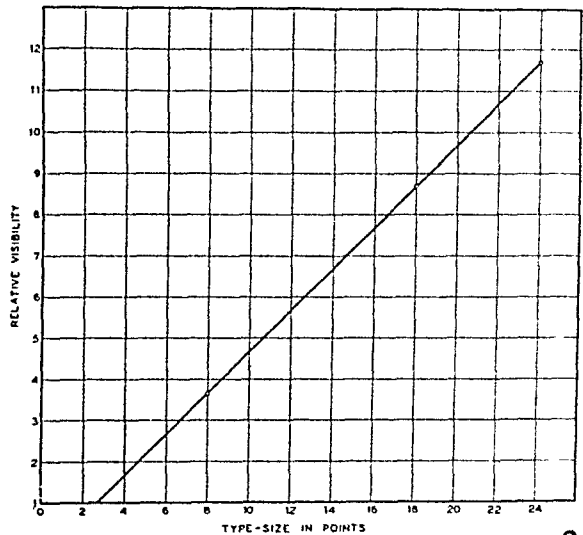
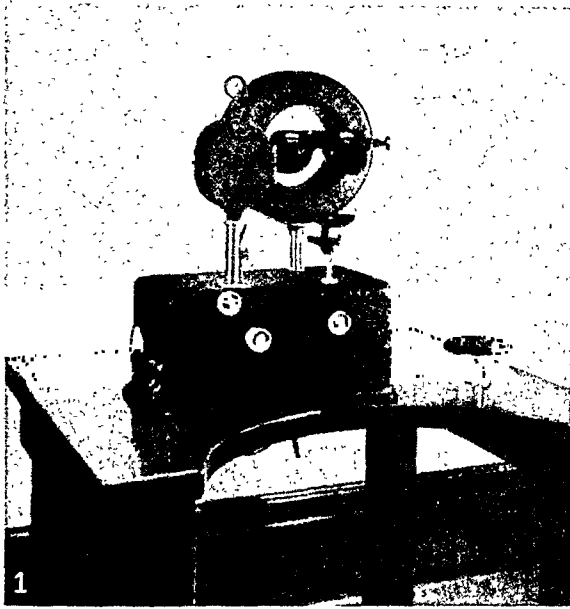


Fig. 1 (Luckiesh and Moss). The Luckiesh-Moss ophthalmic sensitometer. A device for diagnosing and determining ability to see by means of measurements involving brightness-difference as a criterion and involving a technique for prescribing various controllable aids to seeing.

Fig. 2 (Luckiesh and Moss). The relationship between type-size and visibility as determined by means of the ophthalmic sensitometer. The plotted points represent average values derived from 250 observations made by each of 15 subjects possessing normal or near-normal vision. The measurements were made with a level of illumination of 10 foot-candles on the black print on a background of suitable white paper.

gard and its background due to the slightly diffusing characteristics of the photographic filters. The slight diffusion produces the effect of a "veiling" brightness over the field of view. The brightness of the retinal image may be varied by the gradient filters over a range which corresponds to 100 percent in visual acuity or the threshold size of the object of regard. Since the maximum range of the instrument corresponds to 20 times the threshold size, it is seen that the reduction in contrast is the more effective of the two factors in producing threshold conditions. Obviously, the state of retinal

visibility-meter technique is that all observations involve threshold stimuli and therefore represent the *same degree of visibility*. Since differences in the visibility of various objects of regard may be compensated by altering the position of the gradient filters before the eyes, the relative visibility of an object may be expressed as a function of the density of the filters producing threshold conditions. Furthermore, the effectiveness of the filters in altering visibility is not a function of the distance, size, brightness, nor color of the object of regard. It follows, *a priori*, that the determination of the relative visibility of

various objects, for the specific conditions under which they are viewed, is independent of the conditions under which the instrument is calibrated. This conclusion involves the assumption that the scale of relative visibility is based upon the characteristics of the visual sensory processes. The signifi-

vantages for this purpose. Visual acuity has long been a means of appraising vision. Besides, such data are easily translated into relative distances at which the various objects are just visible. Hence the significance of such appraisals of visibility is obvious to the vast majority of nontechnical persons

Table 1

THE INDIVIDUAL VALUES PRESENTED IN COLUMNS THREE AND FOUR REPRESENT THE AVERAGE OF A SERIES OF 10 MEASUREMENTS OF VISIBILITY UNDER A LEVEL OF ILLUMINATION OF 10 FOOT-CANDLES. THE VALUES GIVEN IN COLUMN SIX INDICATE THE LEVELS OF ILLUMINATION WHICH ARE REQUIRED IN ORDER TO INCREASE THE VISIBILITY OF 18-POINT TYPE TO EQUAL THAT OF 24-POINT TYPE UNDER 10 FOOT-CANDLES.

Diagnosis	Number of Subjects	Visibility			Foot-candles on 18-pt.	Probable Errors	
		18-pt.	24-pt.	18/24		18-pt.	24-pt.
Medium myopia (3-6 D.)	5	7.88	10.16	0.81	15.4	1.8	2.5
High myopia (over 6 D.)	15	5.71	7.90	.73	18.4	2.2	2.6
Simple myopic astigmatism	12	4.22	5.68	.75	19.1	2.2	2.6
Compound myopic astigmatism	3	6.60	9.11	.71	30.9	2.7	3.1
High hyperopia (over 6 D.)	1	6.51	10.33	.63	22.8	1.9	3.1
High hyperopic astigmatism	4	4.55	6.78	.70	20.9	1.8	2.4
Myopia and nystagmus	2	3.96	5.10	.78	13.2	1.0	2.0
Myopic astigmatism and nystagmus	1	1.84	2.78	.66	19.0	0.9	1.8
Hyperopia and nystagmus	1	1.65	1.99	.83	28.0	1.6	2.7
Astigmatism and nystagmus	1	1.86	2.46	.76	24.0	1.5	1.0
Ophthalmic blennorrhea	1	2.24	4.95	.45	26.7	2.0	1.4
Cataracts	2	2.60	4.31	.58	17.0	2.0	3.8
Corneal opacities	6	4.16	5.58	.76	16.0	2.0	2.8
Albino and nystagmus	3	1.45	2.15	.67	21.7	1.6	2.7
Aphakia	1	3.35	4.00	.84	16.6	1.2	0.9
Subluxated lens	1	3.30	3.82	.87	13.7	1.1	1.7
Choroiditis	2	3.89	4.90	.78	15.9	1.8	2.4
Ptoxis	1	2.41	3.27	.74	18.5	1.7	2.0
Divergent strabismus	1	6.30	8.07	.78	12.5	1.7	2.1
Choroidoretinitis	1	1.49	2.16	.69	32.0	2.7	3.4
Secondary retinitis	1	5.15	6.43	.80	13.9	1.0	2.5
Old interstitial keratitis	2	4.48	5.29	.84	14.8	1.4	2.4
Optic atrophy	3	2.29	3.16	.72	23.3	2.4	2.2
Choroid retinal scars	1	4.15	6.92	.60	39.0	2.1	1.7
Pigment degeneration of retina	1	1.84	2.18	.84	21.5	2.3	0.9
Weighted arithmetic mean	72	4.50	6.15	.74	19.8	2.0	2.1
Group with "normal" vision	10	8.69	11.68	.75	15.6		

cance of the scale of relative visibility is augmented if the unit of visibility is a rational rather than an empirical one. Our unit is based upon the resolving power (or acuity) of average normal eyes under certain prescribed conditions for seeing.

Although relative visibility may be expressed in terms of any one of the four fundamental variables of the visual threshold, the factor of areal extent or size possesses certain inherent ad-

whose safety and welfare depend upon seeing and who generally exercise control over conditions for seeing in practice.

Relative visibility of print

The experimental data are summarized in table 1. At the bottom of the table it will be noted that the average visibility of 18-point type is 25 percent less than that of 24-point type. Thus the visibility of these particular

type-faces is directly proportional to the size of the type expressed in "points." From the fifth column it will be noted that approximately the same ratio in visibility between these two sizes of type is obtained by both the normal-vision and subnormal-vision groups. The ratios obtained by various individuals vary considerably but inasmuch as the probable errors of the data from which these values were computed are of the order of 2 percent, the ratios obtained are reliable from a statistical viewpoint. Thus it is obvious that the same increment in type-size is not equally effective for different individuals. This conclusion is supported, *a fortiori*, by the fact that one subject was unable to resolve 18-point type even though the level of illumination was increased from 10 to 150 foot-candles.

It is assumed that the effectiveness of a given increase in type-size is inversely proportional to the visibility ratio obtained from threshold measurements. Although the effectiveness of a given *increment* in type-size, as a controllable factor in seeing, varies among individuals, it is concluded from these data that the differentials are not large enough to necessitate a quantitative consideration of this fact. Furthermore, it will be noted that the cases in which the visibility ratios between 18-point and 24-point type are markedly lower than the average value, are the exceptional ones. In these cases, the improvement from a given increment in type-size is greater than that obtained in the usual case. In general, it may be concluded that visibility is increased approximately in proportion to the increase in the physical size of the type-face. However, this does not mean that the increments in visibility, in terms of size of object, serve the human seeing-machine in the ratios indicated, as will be noted from the relationship between size of object and visual efficiency approved by the American Medical Association.

Since size and brightness are complementary factors of the visual threshold, a deficiency in the one may be compensated by an augmentation in the

other, within certain limits.² Hence, it becomes important to determine the differential in level of illumination which is equivalent to a given differential in type-size. In the sixth column of table 1 are shown the levels of illumination required upon 18-point type in order to produce the same degree of visibility afforded by 24-point type under a constant illumination of 10 foot-candles. If average values are considered, it will be noted that 19.8 foot-candles are required for 18-point type when appraised by the subnormal-vision group. The corresponding value for the normal-vision group is 15.6 foot-candles. In general it may be concluded that the difference in size between these two type-faces, may be offset by providing twice the foot-candles on the matter printed from the 18-point type. As a lighting problem, the augmentation of levels of illumination now in general use by a factor of two does not involve either technical or economic difficulties. In fact, much greater increases may readily be obtained by proper considerations of light control and distribution. The foot-candle values discussed in this paper are those involved in the matter of visibility. They are not to be considered as recommendations for sight-saving classrooms. Formidable reasons are available for recommending appreciably higher values for any classroom with its variety of tasks varying greatly in visibility.

Standards of visibility

Obviously, by increasing either type-size or level of illumination visibility is increased. Since optimum degrees of visibility are not obtainable within a practical range of the controllable variables, the specification of definite visual conditions for sight-saving classes involves various compromises. For sight-saving pupils, the appraisal of the benefit derived from higher degrees of visibility is made even more difficult by reason of the serious need of maximal visual assistance. However, these compromises may be made upon a rational basis. Such a basis is herewith presented and applied to the visual prob-

lems of the sight-saving class. As a result, certain "standards of visibility" are indicated.

The data plotted in figure 2 show the relationship between type-size and visibility³ as determined by ten adult subjects possessing normal or near-normal vision. The intensity of illumination was 10 foot-candles in all cases and the style of type used was a common acceptable one known as Bodoni. The fact that the relationship is a linear one is due largely to empirical factors and may not be assumed for other type-faces. However, the particular function describing this relationship is of minor significance. The important characteristic is that it provides a frame of reference upon which the degrees of visibility obtained under specific conditions by subjects of very subnormal vision may be compared with those obtained by normal-vision subjects. This translation of visibility data, obtained under conditions prevailing in sight-saving classes, to a scale applicable to normal vision and usual tasks, involves certain inherent advantages.

An acceptable standard of type-size is definitely indicated by the characteristics of good typography since these standards have been evolved as a result of mass experience for generations. Furthermore, it seems reasonable to conclude that normal vision has been assumed in the design of type-sizes. Hence the fact that 10-point or 12-point type is used in the better grade of books may be considered as an indication of the desirability of these sizes. Furthermore, it may be assumed that 12-point type represents a practical maximum, since 14-point type is rarely used for the solid text-matter of books designed for adults. It seems obvious from introspective considerations that larger sizes would not be desired by readers possessing normal vision. The specification of an "acceptable standard of visibility" may be based upon the apparently justifiable assumption that *at least* the same degree of visibility should be obtained by sight-saving pupils as that obtained by normal-vision subjects performing an easy visual task in cases where this is possible. For reasons already stated, the authors believe that 12-point type

represents such an acceptable standard task, if other factors are adequate, such as brightness and contrast.

It is conceivable that a higher degree of visibility than that which has been designated as an "acceptable standard" may be desirable for sight-saving pupils. Such a standard may be described as a "recommended standard of visibility." If 12-point type under 10 foot-candles is assumed as a minimum standard, then 12-point type under 20 foot-candles might be taken as a possible "recommended" standard of visibility. However, the important fact is that the selection of a specific degree of visibility reduces the problem of specifying type-size for sight-saving pupils to a rational basis.

Let it be assumed, for the moment, that 12-point booktype represents a visual task which is consistent with reasonable ease and comfort in reading if the printing and lighting are suitable. It will be noted from the data presented in figure 2 that type of this size has a relative visibility¹ of about 5.7. Hence this datum may be regarded as "an acceptable standard of visibility" for sight-saving subjects. Furthermore, it will be noted from the average values presented in table 1 that relative visibilities of 4.50 and 6.15 were obtained by the subnormal vision group for 18-point and 24-point type, respectively. Hence it follows *a priori* that 24-point type, illuminated to 10 foot-candles, represents a visual task for the subnormal-vision group which is approximately equivalent in visibility to 12-point type, under the same illumination, for the normal-vision group. Therefore, it seems reasonable to conclude that the sight-saving pupils, *as a group*, are provided about the same standard of visibility through the use of 24-point type (under 10 foot-candles) in so far as this factor is concerned. However, it is emphasized that the method of designating a standard of visibility is the primarily important phase of this discussion and that the standard proposed serves merely as an example and not as a recommendation.

It is now of interest to examine the results obtained by various individuals of the subnormal-vision group. It will

be noted, for example, that the relative visibility obtained by the two subjects with cataracts averaged 2.60 and 4.31 for 18-point and 24-point type, respectively. Obviously, these pupils did not receive the visual assistance from the factor of type-size that is demanded by the standard of visibility which has been assumed to be a rational and conservative one. As tasks for normal eyes, these visibility values correspond to 6-point and 9-point type, respectively, as shown in figure 2. Furthermore, it will be noted that these equivalent type-sizes are reduced to approximately 3.5-point and 5-point, respectively, for the pupils in the lower ranges of visual efficiency. Therefore, it may be concluded that 18-point type, in comparison with 24-point type, cannot be recommended in such cases unless it is possible to augment visibility by some other means.

The data of table 1 also indicate that the tentative standard of visibility—that of 12-point type illuminated to 10 foot-candles—may be obtained by certain subjects from either 24-point type under 10 foot-candles or from 18-point type under higher levels. For example, the group with simple myopic astigmatism obtained a visibility rating of 5.68 from 24-point type under 10 foot-candles, and the same rating from 18-point type under 19.1 foot-candles. Since the "standard of visibility" is equivalent to a rating of 5.7, it is obvious that the type-size may be reduced, for these subjects, from 24-point to 18-point if the illumination is increased from 10 foot-candles to approximately 20 foot-candles. However, it will be noted that a rating of 5.7 in visibility is not attainable by many of the subjects even with the 24-point type. Hence an augmentation of the illumination is the only available means for approaching the assumed standard of visibility. The latter conclusion is based upon the assumption that 24-point type is the largest size practicable.

Theoretical considerations

It seems reasonable to assume that the advantage of higher degrees of visibility resulting from larger type-sizes

may be discounted, to some extent, due to (1) the increased muscular effort expended in orientation and fixation during the reading of a given number of words and (2) to perceptual anomalies which may be introduced by the decreased number of letters included in the perceptual span.⁴ Furthermore, it is possible that these negative factors may be of such an order of magnitude that a definite optimum in type-size is reached for sizes less than 24-points in certain cases. For example, it will be noted in table 1 that the subjects with medium degrees of myopia indicate visibility ratings comparable to those corresponding to normal-vision subjects. Hence, it may be concluded that 18-point or 24-point type is not required in these cases and that a reduction in type-size might represent a refinement in ocular hygiene. The data of table 1 indicate that the maximum type-size is not required in certain other cases in order to attain an acceptable standard of visibility.

These generalizations do not imply that the utmost refinement is necessary in regulating visual tasks in accordance with the visual characteristics of the individual. Such a procedure, although ideal from a theoretical viewpoint, is obviously impractical in sight-saving classes. However, certain approximations are possible.

By means of the technique already described it is possible to classify sight-saving pupils into a limited number of groups and provide each group with the proper size of type. The latter will be that size which produces the same degree of visibility, when this is possible, as that obtained by subjects of average normal vision from 12-point type illuminated to 10 foot-candles. Obviously, the visibility measurements by the sight-saving pupils are to be made under the same level of illumination as that which prevails or will prevail in the classroom. An analysis of the data presented in table 1 indicates the desirability of at least three different sizes of type.

24-point—For pupils obtaining a visibility rating less than that adopted as a standard with type of this size. In general these pupils require the maximum

in both type-size and level of illumination.

18-point—For pupils obtaining a visibility rating approximately equal to the standard with type of this size.

12-point—For pupils obtaining a visibility rating comparable to that obtained by normal-vision subjects. This classification is based upon the assumption that these pupils are benefited very largely by the practice of ocular hygiene in the sight-saving routine; and to a lesser extent by reason of large type-size.

In the completely controlled situation, the preceding classifications involve the assumptions that refractive errors have been corrected as completely as possible and that the lighting, as the second controllable factor in seeing, is also satisfactory from the viewpoint of modern knowledge and practice. A number of such installations are now in use and have been described in detail elsewhere.⁵ It is emphasized that the measurements presented in table 1 were made under a level of 10 foot-candles. This value approximated the prevailing levels of illumination in the classrooms investigated. Some of the recent lighting installations in sight-saving classrooms provide a uniform, diffused, and automatically regulated illumination in the neighborhood of 30 to 40 foot-candles.

The significance of these refinements in sight-saving technique, as they pertain to muscular phenomena, may be appraised experimentally by determining the relationship between type-size and ocular-muscle fatigue by means of measurements made with an ophthalmic ergograph.⁶ Such an appraisal would logically precede an actual trial in the classroom. In addition, it is probable that the experimental results would be more decisive if the problem is approached by the former method. The relationship between type-size and perceptual phenomena might be determined, at least indirectly, by "speed of reading" tests or by other criteria of similar significance. Such investigations are beyond the scope of the present one which aims toward immediate practical aid to sight-saving pupils.

Visual efficiency

Since the regulation of visual tasks in accordance with the visual efficiency of the individual is an important phase of ocular hygiene in the sight-saving class, the characteristics of the criteria for appraising visual efficiency are correspondingly important. In ophthalmological practice, visual efficiency is usually expressed as a definite function of visual acuity. However, resolving power is but one characteristic of visual function and, in many situations, it is not the primarily important one. As an extreme example, seeing at night outdoors depends largely upon the ability to discriminate brightness-differences. Furthermore, it can be shown that the latter criterion is the critical one under any lighting condition in visual situations involving test objects which are

Table 2

THE VALUES GIVEN IN COLUMNS TWO AND THREE WERE DETERMINED WITH THE SNELLEN CHART; AND THOSE OF COLUMN FOUR BY MEANS OF THE LUCKIESH-MOSS VISIBILITY METER.

Subject	Vision Un-corrected	Vision Corrected	Visibility of 24-point type
1	6/60	6/6	6.03
2	6/60	6/6	9.06
3	1/60	6/6	6.43
4	6/60	6/6	13.10
5	Counts fingers	6/7.5	3.55
6	6/60	6/7.5	4.06
7	6/30	6/7.5	5.03
8	6/60	6/7.5	6.55
9	6/60	6/7.5	7.38
10	6/60	6/20	4.84
11	6/60	6/20	6.40
12	6/60	6/20	7.76
13	Nil	6/30	2.78
14	Nil	6/30	6.40

large in comparison with the spatial characteristics of the retinal mosaic. Although the criterion of visual acuity involves the factor of retinal sensibility, the influence of this variable upon the acuity threshold is relatively slight when high-contrast test objects are used;⁷ or in general, acuity is a rather insensitive criterion for revealing dif-

ferences in retinal sensibility among various subjects. Certainly the available knowledge of seeing proves that individuals with the same test-chart rating are not necessarily equivalent in efficiency as human seeing-machines.

The data of table 2 indicate the differences in efficiency ratings obtained among a group of low-vision subjects by the criteria of (1) visual acuity and (2) minimum perceptible brightness-difference.

Although the vision of the first group was brought to 6/6 by eyeglasses, it will be noted that the individuals of this group are far from equal when appraised by means of brightness-difference thresholds. For example, subjects 1 and 4 differ by more than a factor of two in the size of object just visible under threshold brightness-contrasts. Similar results are obtained for the other three groups. Since the probable errors of the values presented in column four are of the order of 3 percent, these

data are quite reliable from a statistical viewpoint. However, it might be argued that this difference in "visual efficiency" may be due to perceptual rather than ophthalmic phenomena, since the visibility measurements involved ability to read as a criterion in contrast with ability to recognize single characters. This hypothesis may account for some but not for all of the difference observed, since rather large differences are obtained when single test-objects are used in both cases. Furthermore, if perceptual phenomena are important in these measurements, they are likewise important in performing customary visual tasks.

In obtaining the data upon which this paper is based, the authors wish to acknowledge the coöperation of Dr. S. H. Monson and Miss Olive Peck of the Cleveland Board of Education; and the assistance of Mr. S. K. Guth of our laboratory.

Nela Park.

References

- ¹ Luckiesh, M., and Moss, F. K. Visibility: Its measurement and significance in seeing. *Jour. Frank. Inst.*, 1935, v. 220, p. 431.
- ² Cobb, P. W., and Moss, F. K. The four variables of the visual threshold. *Jour. Frank. Inst.*, 1928, v. 205, p. 831.
- ³ Luckiesh, M., and Moss, F. K. The relative visibility of print in terms of illumination intensity. *Sight-Saving Rev.*, 1935, v. 5, p. 272.
- ⁴ Vernon, M. D. The experimental study of reading. Cambridge University Press, 1931.
- ⁵ Sturrock, W., and Staley, K. Sight-saving classrooms adopted by many schools. *Elec. World*, 1934, v. 105, p. 90.
- ⁶ Berens, C. A clinical ophthalmic ergograph. *Amer. Jour. Ophth.*, 1935, v. 18, p. 139.
- Luckiesh, M., and Moss, F. K. Fatigue of the extrinsic ocular muscles while reading under sodium and tungsten light. *Jour. Opt. Soc. Amer.*, 1935, v. 25, p. 216.
- ⁷ Luckiesh, M., and Moss, F. K. A view of the cortical integrational process through liminal visual stimuli. *Jour. Exp. Psych.*, 1934, v. 17, p. 449.

FAILURES AND SUCCESSES IN THE OPERATIVE TREATMENT OF DETACHMENT OF THE RETINA

THOMAS D. ALLEN, M.D.
CHICAGO

The proper study of detachment of the retina is a careful survey of our cases, both failures and successes. Success is not always possible but successes will increase with the honest facing of the poor results and the study of their probable causes. Read before the Chicago Ophthalmological Society, March 16, 1936.

A critical study of one's own case histories in relation to methods of procedure is one of the best methods of evaluating such treatment as has been instituted. Not only should successes be evaluated but also failures, and the questions asked: Why did this patient recover? Why did this one not recover? What did I do that I should have done, or that I should not have done? And what did I not do that I should have done or that I should not have done? How could I have improved my handling of the case? Which technique should I have used?

First of all, it is necessary to have accurate data, else the study of the case is useless; for example:

Case 1. Some six years ago a patient, Mrs. E. E., aged 30 years, was seen by Drs. Wilder, Jacobs, and me. She had noticed only two weeks before a failure of vision of the left eye. The eye was not and had not been red nor sore, but there were occasional sticking pains in it. Her general health had been good. Vision in the right eye was normal with -0.37 D.sph. and the media and fundus of this eye were recorded as normal. In the left eye with the pupil well dilated a large detachment of the entire lower half of the retina was carefully studied. The retina was gray, billowy (top seen with $+11$ D.), and moved easily on movement of the eye. No hole was found. The patient was sent to the hospital, kept in bed for several days, and examined repeatedly. The right visual field was normal, the left roughly comma-shaped, 30 by 40 degrees, with the blind spot apparently at the center. Transillumination (Zeiss) was negative. Dr. Gradle saw the patient in consultation and assisted in the operation—an ignipuncture in the inferior nasal quadrant 12 to 14 mm. behind the limbus. The retina returned immediately to place, but in 24 hours it had again

detached and on the third day was as bad as at first. Two weeks after the first operation a second one was performed: the Gonin cautery was held in the scleral opening previously made while one of us counted rapidly to 10, probably three full seconds. Immediately examination with the ophthalmoscope was made, and no improvement noted. A complete umbrella-shaped detachment developed, but the patient retained for four months a very small central field in which she saw a 1-cm. target at 33 cm. Since then she has not been seen.

Now, what was wrong? Why didn't we succeed? Was the case as well worked up as it should have been? If not, what should have been done? Certainly the detachment was in the most favorable location for a successful operative result. My criticisms of this case would be about as follows:

1. A history of good general health is not sufficient. A thorough search of the body for so-called foci of infection and their elimination is certainly in order, especially infections in the oral, nasal, intestinal, and genito-urinary systems and in the chest. While syphilis apparently plays a very minor role, the physician should certainly know if the patient has such an infection. A patient who coughs can ruin a perfect operation. Should one find dental disease, it is far better to have teeth extracted before than after the operation, from the standpoint of infection and trauma. The work-up from that standpoint, in this case, done six years ago, was not satisfactory.

2. At that time none of us thought of looking for a hole in the attached portions of the retina, else we might have found one or more holes in the upper half.

3. The actual technique of operating on such a patient has undergone a change in the past several years. In-

stead of one hole in the sclera for drainage and adhesive choroiditis we now try to make many, and instead of the severe cauterization of several seconds, we scarcely more than touch the choroid; certainly few of us sear the vitreous. Also, I wonder about examining the eye within 24 hours of operation.

Case 2. Mrs. E. S., 48 years old, with bilateral high myopia (R. —17.00, L. —18.00) had bumped her forehead, left side, some two weeks before I saw her in January, 1933, since which time she had been able to see shadows only with the left eye—previously the best eye—and had seen many spots before the right eye. She had been treated for syphilis for seven years by Dr. Esther Rahn, who only the day before had given her mercury intragluteally. The patient had six children, three living and well, two had died in infancy of rickets, the last one died at 17 days, probably of syphilis, as the primary infection occurred just before her last pregnancy. All her teeth had been removed during the previous few years.

Vision O.D. with glasses was 10/200 (less than vision in the left eye), the fields being grossly normal; O.S., was 20/200. A detachment was far out in the inferior temporal quadrant, 8 to 10 disc diameters across. No hole was found. Transillumination was negative (Zeiss). The patient was kept in bed at home one week and then, as no improvement occurred, was taken to Cook County Hospital; after another week in bed no detachment could be seen. After a third week in bed she was gradually allowed up and three weeks later the right vision, with glasses was 20/200; left vision was 20/50—(probably about normal for her as myopic changes crowded the yellow spot).

There was no detachment. She was sent home and seemed normal for two months; then the detachment recurred, even worse than before, as vision in the left eye was reduced to counting fingers. A small, round retinal hole was found and after some 10 days operated upon by the Gonin technique, using the electric cautery. The cauterization was slightly too far back and too high, so the sclera anteriorly and lower down was cauterized lightly. The immediate

result seemed to be very good. No intraocular hemorrhage occurred and the retina seemed in place. Soon after the operation the patient ate some soup which upset her and caused considerable vomiting and ocular discomfort.

The first dressing was done on the seventh day. A large intraocular hemorrhage was found. Vision was light projection only. No subsequent improvement was found.

Comments: 1. The general examination had been thorough. The teeth were out and gums were clear. The patient had had proper treatment for her syphilitic infection of seven years' standing. Bed rest was followed by spontaneous reattachment.

2. Recurrence after two months. Was this due to relaxation of vigilance and care? Or was it due to the development of the hole which was then found?

3. The immediate result of the operation was good; but the postoperative hemorrhage probably was due to retching and vomiting.

Case 3. Mr. F. H. L., 61 years old, had first been seen four years previously. This is a case which Dr. Milton Jacobs has kindly consented to have included in this discussion. There was myopia of about 10 and 13 D., and a detachment of four days' duration. Vision in the left eye was reduced to occasional 20/200. The entire upper left retina was detached: two small holes at the 11-o'clock and 2-o'clock positions were seen, 60 degrees out. Transillumination (Zeiss) was negative. The patient was seen in consultation by Dr. Wilder who recommended electrocoagulation in the area opposite the holes.

With rest in bed the detachment moved to the lower half of the retina, the upper half being replaced. After a week in bed the cautery was used as planned at the 11-o'clock position, 12 mm. from limbus, through a trephined hole, the searing of the choroid being for about one-half second. As the eyeball collapsed on trephining, the cautery was used without trephining at the 2-o'clock position, 12 mm. from the limbus; it took about two seconds for the cautery to sear through the sclera. A spark diathermy was used around each scleral hole in four places.

The result was excellent for the first nine days; then the upper outer quadrant became detached, but no holes were found in the retina. Another operation was performed two weeks after the first operation: two trephined holes were made in the sclera at the 1- and 2-o'clock positions, 14 mm. from the limbus. After evacuation of subretinal fluid the cautery tip was touched to the choroid in the trephined holes. Two weeks later the patient left the hospital, the retina being in perfect position. Two months later redetachment occurred below. No holes were seen in the retina. Vision was reduced to counting fingers at one foot.

At the third operation, two trephined holes were made at the 4- and 8-o'clock positions, 12 mm. from the limbus, and the same procedure carried out as previously. Three and six days later the retina was in place and no complications had developed, but on the fourteenth day it again became loose; still no tears were seen.

A fourth operation was performed, the trephining being at the 7-o'clock position, 13 mm. from the limbus; a spark diathermy of the sclera was carried out in about 20 places nearby without accident. On the fourth day apparently successful healing had begun, but three days later the lower retina again became detached. No further treatment was advised.

Comment. Again, what went wrong? We had excellent immediate results from each operation. After the first operation the result was good for nine days; after the second for two months; after the third for 11 days; after the fourth for six days. Was it possible that we didn't exactly and completely hit and sear all the holes? Was it due to some focus of infection or some general toxemia? Or to secondary cicatricial bands in the vitreous?

Case 4. Mr. R. G. J., aged 49 years, was sent by Dr. Clement to Dr. Wilder for operation for detachment. He was about 7 D. myopic and had worn glasses for 36 years. He had been injured in an automobile accident seven months before, cutting the outer corner of the right upper eyelid, and although he had been seeing some floating spots

before his left eye for many weeks, he had only a few days before noticed a considerable increase in those spots. The right vision was 20/30 with glasses; left vision, counting fingers at 6 to 8 feet. The right visual field was slightly contracted concentrically, the left field contracted below almost to the fixation point. Tension was normal. Pupils dilated readily. A large pendulous detachment of the retina was found in the upper temporal quadrant of the left eye. No tears were seen. Transillumination was negative. At operation a trephine hole was made at the 1-o'clock position (upper temporal quadrant), 14 mm. from the limbus and electrocautery tip inserted three times after a large amount of subretinal fluid was evacuated. The patient was quite restless. On the fourth night he sat up in bed and gasped for breath. Three weeks postoperatively the retina seemed to be in place and the patient was sent home to increase his activities slowly. The visual field was full six weeks after the operation but two months postoperatively there was a recurrence of the detachment, this time below. No holes were found. Another operation was performed, with trephining at the 5- and 7-o'clock positions, 12 mm. from the limbus. The procedure was similar to that of the previous operation. Three weeks later the patient left the hospital with an excellent result: The retina was in good position, vision was 20/40. When seen two years later, vision was the same, the media were clear, the retina in excellent position. The choroidal pattern was good and there was minimal reaction to the cautery. I telephoned him last week and he said his eyes were the same. He admitted he no longer rides horseback nor dives, but that he does swim and climb stairs and in nearly every other way has normal activities.

Comment: Was he just fortunate not to have focal infection or sources of toxemia? And was the detachment after the first operation due to his restlessness on the fourth postoperative day? He was certainly an ideal patient at the second operation, and subsequently very cautiously increased his activities. We never did find a hole nor tear, al-

though several of us looked very carefully. The operative technique was scleral trephining followed by cauterization, through the trephined hole, of the choroid and probably of the retina.

Case 5. Mrs. J. J. F., aged 58 years, also a patient of Dr. Wilder, was first seen in February, 1931. Spontaneous detachment of the left retina had occurred one week before. The right vision was 20/20+ with perfect fields; the media and fundus were normal. The patient had been in very good health. Vision in the left eye was counting fingers at one foot, in the upper and temporal fields. The left pupil dilated well. There was a large overhanging detachment covering the optic disc. The top was seen with +12 D. The retina fluttered when the eye moved. Transillumination (Zeiss) was negative. Tension was 13; no tear was seen.

After some rest in bed, no improvement being manifest, a scleral puncture was performed at the 1-o'clock position at the equator (upper outer quadrant); this allowed some subretinal fluid to escape. The following day a tear was seen in the upper nasal quadrant; this was repeatedly localized during the following week and then an ignipuncture was made after a posterior sclerotomy had allowed the evacuation of considerable subretinal fluid. The cautery touched the choroid about 1 disc diameter from the tear. The operation was partly successful, but the upper temporal detachment remained. One week later a sclerectomy was done at the 12:30-o'clock position (a V-shaped flap made and excised, leaving a 3-mm. hole). A large amount of subretinal fluid was again evacuated; there was a slight hemorrhage; a cautery of choroid and retina was done by barely touching them. Evidently, this was unsuccessful and resulted in another retinal hole, as a final cauterization of the sclera with further evacuation of fluid was necessary. This last cauterization did not exactly reach the hole in the retina, but the retina remained flat although somewhat edematous. The edema was marked just above and temporal to the yellow spot. It gradually subsided. In the course of the recovery numerous small, flame-shaped hemor-

rhages were found in the retina near the areas operated on. The resulting field was contracted below only 15 degrees and vision with glasses was 20/50+. When last seen, over two years after the last operation, the retina was in place throughout.

Comments: 1. A hole in the retina was found only after evacuation of subretinal fluid. It was not perfectly sealed at once by the ignipuncture.

2. One posterior sclerotomy did not cause a retinal tear, apparently—possibly the knife did not touch the retina. One posterior sclerotomy apparently did cause a retinal tear which in part sealed itself, as the cautery tip was not exactly placed so as to include it in the immediate scar. Yet in spite of the imperfect applications the retina eventually became flat.

3. I do not like posterior sclerotomy. I much prefer trephining.

4. If at first you don't succeed, try, try again. Here four operations were necessary, but the result was excellent.

Case 6. Mr. E. T. B., aged 35 years, was first seen in May, 1931. His history was that for four weeks the upper half of objects had been blurred. One month before, he was hit on the left supraorbital region by a foul ball while playing indoor ball. Vision, O.D. (with glasses) +2.75 D. cyl. ax. 90° was 20/20+; O.S. (with glasses) +0.75 D.sph. \approx +3.50 D. cyl. ax. 90° was 20/200 eccentrically. (Four years before his vision had been 20/20.)

There was a detachment of almost the entire lower retina. The top was seen with +8 D. The detachment seemed to involve the yellow spot. The tension was normal and transillumination negative. There was a disinsertion at the periphery between the 4- and 5-o'clock positions.

As the patient had several very questionable teeth, I insisted that these be removed before the operation on the eye. When this was done I trephined 10 mm. from the limbus in axis 135 degrees and with electrolysis cauterized the sclera around this in five places, each 1½ mm. from the trephined hole and about equally spaced. Considerable subretinal fluid escaped on trepanation. I examined the eye on the fifth day and

could find no detachment and no retinal hole nor tear. Both eyes were bandaged for two weeks, and the patient was sent home after another two weeks. The visual field was almost entirely normal and vision with glasses 20/30 (three months ago 20/25). The patient gradually increased his activity, and six months later played handball and volleyball again. After the retina had returned to its place, I found an old healed area of choroiditis in a portion remote from the operative area.

Comments: 1. Here we had possible foci of infection removed before operating. An old choroiditis may have been a contributing cause of the detachment. It is known that choroiditis without coincident proliferating retinitis is often associated with a detachment. Is there an etiological relationship? Sometimes there seems to be, but the objective of our operative attack is to produce a chorioretinitis adhesiva; and successful results do often follow.

2. Simple trephining with electrolysis of the sclera to produce discoloration in five surrounding spots and evacuation of the subretinal fluid, were all the treatment this man received aside from bed rest.

Conclusions

From a close study of the records of six cases of detachment of the retina, selected because of their study value alone, I have gleaned the following points which may be of interest to others also.

1. A more thorough study of the general health of the patient should be made, including the heart and blood vessels, genito-urinary system, air passages and lungs, mouth and intestinal tract; and the presence or absence of tuberculosis, syphilis, and so forth, should be determined. More attention must be given to the possibility of postoperative hemorrhage.

2. Occasionally spontaneous reattachment occurs. Therefore, there is no necessity to operate hurriedly. Several days or a week in bed should precede operation. During this time study of both eyes and the other systems may be made and the findings verified. Also treatment should be instituted as indi-

cated by such study.

3. A preliminary operation may be advisable to draw off some of the subretinal fluid so that the holes may be mapped out. This was distinctly advantageous in case five and might have been of benefit in several others.

4. It is advantageous to prevent distortion of the globe by loss of subretinal fluid before the final stages of the operation.

5. Scleral electrolysis with subsequent trephining would be ideal if we could always be sure to reach the choroid. But it is difficult to ascertain just how much choroiditis will be produced, especially if the area one desires to treat is rather posterior. I have, therefore, adopted the Gradle electrode which I use with the Walker diathermy outfit.

6. In order to cause continued postoperative drainage of subretinal fluid until the retina is caught in the adhesive choroiditis produced, it is best to make a large opening which will drain for several days; ordinary posterior sclerotomy will not usually do this, nor will multiple micropunctures of the sclera. It takes longer for a 2-mm. trephined opening than for a minute puncture to heal. Sixty minute punctures will heal about as quickly as one.

7. My best results have been with cases in which we could locate one or more holes or tears or disinsertions and direct our attention specifically to them, although in case four the retina was twice detached, once above and once below; in each case no hole could be found and each time operation was successful.

8. I am inclined to think that too early postoperative examination is bad. I like to wait five to seven days for the first dressing.

9. Edema of the retina is often difficult to differentiate from a flat detachment: the color of the vessels will help. Edema usually disappears spontaneously after some weeks.

There is great value not only to the ophthalmologist but also to the patients, in a close study not only of his successes, but also, and probably more profitably, of his failures.

122 South Michigan Avenue.

NOTES, CASES, INSTRUMENTS

A ONE-METER PERIMETER*

ALFRED COWAN, M.D.
PHILADELPHIA

The arrangement I am about to describe has been found very useful. In fact, during the past year, I have used it to the exclusion of all other instruments for field studies.

diating and circular lines marked for an angular distance of one meter. The markings are deeply scratched in the linoleum and the whole surface painted a flat black so that, to the patient, it appears to be an almost homogeneous surface. The soft material allows the field to be plotted with small pins, and when it becomes soiled can be re-

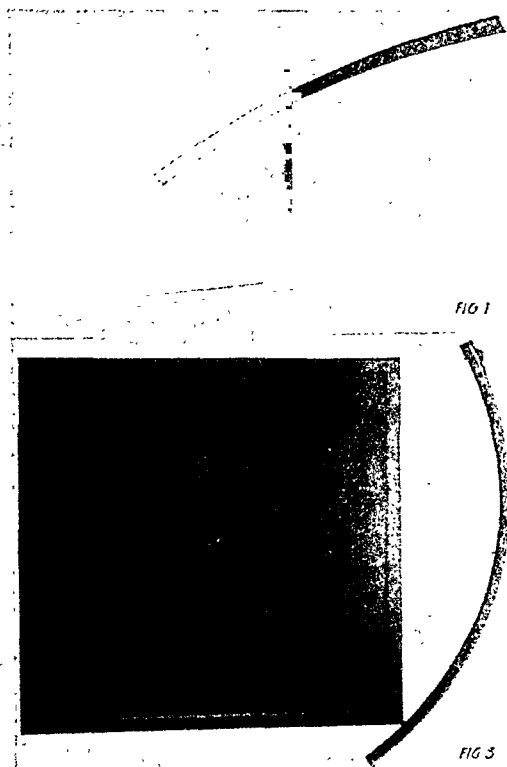


FIG 1

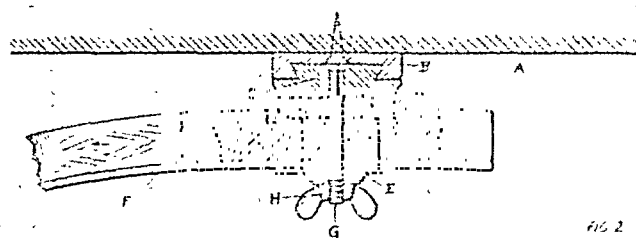


FIG 2



FIG 3

Fig. 1 (Cowan). Screen and perimeter ready for use.

Fig. 2 (Cowan). Details of working parts. A. Tangent screen. B. Wall socket. C. Socket head. D. Rear friction member. E. Front friction member. F. Arm. G. Axis stud. H. Friction regulating nut.

Fig. 3 (Cowan). Perimeter arm detached and hung flat on wall when not in use.

Fig. 4 (Cowan). Method of fixation with plane mirror for plotting central scotoma of left eye.

Briefly, this instrument is a perimetric arc with a radius of one meter describing one fourth of a circle. The arc is removable and when used is attached to the center of a tangent screen $1\frac{1}{2}$ meters square. The screen is made of soft linoleum painted black, with ra-

Painted without affecting the markings.

The arc is made of light wood composition as shown in the illustration. It is three inches across the face and marked every 10 degrees. The drawing illustrates both the mechanism of the fixed portion (B, fig. 2) which is permanently screwed into the screen on the wall, and the socket head on the arc. The fixed portion does not inter-

* Presented before the Section on Ophthalmology, College of Physicians, February 20, 1936.

fere with the use of the tangent screen when the perimeter arc is removed. A large window toward the north, about six feet from the screen, is the source of illumination. With this arrangement we have the advantage of a working distance of one meter, 90 degrees in any direction in which the arc is turned, and about 30 degrees in every other meridian.

It is not the purpose of this communication to speak of the advantages or disadvantages of a large perimeter; but I should like to state that the same advantages apply to peripheral-field study at greater distances as to central-field study at one or more meters' distance. The real objectionable feature to a large perimeter is the great amount of room it takes—a most logical objection; but, of course, eliminated here by the removability of the arc when not in use (fig. 3).

For the study of central scotomata I use, for fixation with the good eye, the small mirror on a handle (fig. 4); a modification and simplification of the method described by Marcove and me in the *American Journal of Ophthalmology*, August, 1929.

1930 Chestnut Street.

A TECHNIQUE FOR INTRACAP- SULAR EXTRACTION OF CATARACT

DANIEL B. KIRBY, M.D.
NEW YORK

The following points have been used to advantage and with success by the author and have been taught to others. The usual preparations are made. All the possible safeguards, such as retrobulbar injection, akinesis, external canthotomy where necessary, wound sutures, etc., are used.

There are two particular points of interest in the technique. First, an attempt is made to rupture the lower semicircle of the zonular fibers by applying carefully graduated pressure with the point of the lens hook just within the corneal ring before the forceps are applied to the lens capsule. It is, of course, realized that this is essen-

tially the first step in the Smith technique; also that, in the Knapp method, the forceps are removed as soon as this rupture below has been accomplished. With the present method, the forceps are applied directly after the stage of rupture below and are used to guide the lens out, the vis a tergo being furnished with the lens hook. The relaxation of the capsule permits of an easy grasp. Second, a suture which has been placed in the superior sclero-corneal margin is used by the assistant under the operator's direction to elevate the corneal flap and thus afford a view of the upper third of the lens capsule while the forceps are being applied. The lens may be tumbled by applying the forceps below. This suture controls the flap easily, does no harm to the cornea, and is used in the end stage of the operation to reinforce the closure of the wound.

So far, the technique has offered greater success and less hazard in the hands of the author than any other method tried.

780 Park Avenue.

UNUSUAL CATARACT COMPLI- CATION FORTY YEARS AFTER OPERATION

VIRGIL J. SCHWARTZ, M.D.
MINNEAPOLIS

Mr. G. F., aged 48 years, was born in England with bilateral congenital cataracts. These were needled at Moorfield's Eye Hospital in London when he was less than 10 years old. Infection developed in the right eye, and this had to be enucleated. The left eye, however, made an uneventful recovery, and with appropriate glasses he has lived a useful life, despite the fact that he has had multiple sarcomata, requiring amputation of the left leg and arm. I have tested his refraction from time to time, the last such occasion having been on April 3, 1934. At that time with a lens his vision was 20/25.

On March 15, 1935, he presented himself with the history that about three weeks previously the vision in his left eye had become suddenly very poor. A crescentic gray membrane, evidently a

piece of capsule which had become loosened, hung into the anterior chamber through the pupil. The lower and anterior end was free, while the other end was still attached posteriorly, doubtless to the zonule at the temporal



Fig. 1 (Schwartz). The pupil has been partly dilated with homatropine. Prolapsed crescentic membrane can be readily seen.

side. When the pupil was normally contracted the membrane practically occluded it. Fortunately, however, the membrane was translucent, though not transparent, so that the patient could get about. When the pupil was a little dilated, as with homatropine, he was able to see below the membrane, and could even read for a short time. In this condition his visual acuity was 20/30.

Inasmuch as there is marked iridodonesis it is quite possible that there may be a fluid vitreous. The question, therefore, as to the advisability of operative interference arises. It would seem not difficult to open the anterior chamber and insert a pair of iris forceps, or some other suitable instrument, and so withdraw the membrane. However, since this is an only eye, and the patient can see to do his work reasonably well, it is probably best to leave it alone, particularly since the use of 1- or 2-percent homatropine once a day gives him satisfactory vision.

The length of time which has elapsed since operation, and the peculiar nature of the complication make this case somewhat out of the ordinary.

617 Medical Arts Building.

EPIDEMIC KERATOCONJUNCTIVITIS DIVERSIFORMIS

H. G. MERRILL, M.D.

SAN DIEGO, CALIFORNIA

For the past two years I have been seeing with increasing frequency a puzzling condition which I have thought to be follicular conjunctivitis in the epidemic form. Recently Col. Robert E. Wright, of Madras, India, lectured at Los Angeles, and this condition now widely epidemic in the western part of the United States was found to coincide very closely with an epidemic of a disease Colonel Wright chooses to call "epidemic keratoconjunctivitis diversiformis," which raged in India between 1928 and 1934, reaching its peak in October, 1932. The clinic over which Colonel Wright presides took care of over 12,000 cases during this time. In my ordinary practice I am seeing from one to eight cases almost every day. The numbers have slightly increased for the past two years.

The signs are much more prominent than the symptoms, which, in fact, are almost absent. It is mildly contagious, occasionally several members of one family having it, but sometimes only one member. The first sign is a slight redness in one eye. In its usual form it is best recognized by beadlike rows of follicles limited to the conjunctiva of the lower lid and most pronounced near its temporal end. While most of the cases would not be recognized either by the patient or anyone observing him, it sometimes, during an exacerbation, appears like acute trachoma of the most violent form. There is little or no discharge. Sometimes there is edema of the bulbar conjunctiva, the lids in severe cases being extremely swollen and sometimes having small ulcers along their margins. The cornea in many of the cases remains normal in appearance but a slitlamp study in some of the cases reveals small curdlike opacities, which are often very superficial but which may be so deep that the endothelium seems involved. These opacities increase in size but clear in the center so that a series of ringlike or semilunar opacities are observed. The condition takes from



Fig. 1 (Merrill). Follicles in lower cul-de-sac.



Fig. 2 (Merrill). Edema of bulbar conjunctiva.

three to 18 months, in a few cases even longer, to disappear.

Bacteriological studies have been negative. Colonel Wright says that Herbert described a bipolar organism as the cause, in 1901, but that no one has confirmed his work. The disease has been successfully inoculated from one human eye to another but in white rabbits inoculation was not successful. The incubation period is said to be from one to four weeks. The cases in India often showed enlargement of preauricular lymph nodes but I have not observed this here until recently, when two patients showed unilateral enlargement on the affected side with acute exacerbation of eye signs.

My cases have come from several states of the West, especially from Idaho, Utah, Nevada, and California, but I have had two cases from Canada. If school physicians would evert the lower lids of the school children I am quite sure they could pick out numerous cases in those attending our schools now.

The corneal opacities spoken of usually do not stain but a few will stain and the epithelium taken from the eye for section often shows inclusion bodies like Negri bodies. The corneal sensibility is normal. There is no fever but often a mild, hardly recognizable, quiet iritis. Eventually the vision is not af-

fected. As mentioned before, many patients have exacerbations which are sometimes very troublesome. In the cases in which the cornea escapes it is frequently impossible to differentiate the condition from follicular conjunctivitis. The conjunctiva of the upper lid, however, is not usually involved.

As to the treatments that I have tried, adrenaline chloride with boric acid and weak zinc solution together with silver nitrate along the edges of the lid in the very severe cases seem to be as good as, or better than, anything else. Perhaps the one needed warning is not to subject these eyes to severe treatment as they all eventually get well anyway. In the earlier cases that I have seen the conjunctival signs greatly overshadowed the corneal signs. The fact that the condition is so devoid of discomfort even when rather severe accounts no doubt for the little attention given to the epidemic, which has already reached an unbelievable magnitude. So far as I am aware this is the first epidemic of its kind to appear in the United States. Europe and Asia have had numerous epidemics and several times this entity has been described as a "new disease." It is to be hoped that this preliminary report will stimulate further investigation.

3245 Fourth Avenue.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

January 10, 1936

Dr. George E. McGeary, presiding
Tularemia

Dr. M. C. Pfunder (Minneapolis) read his inaugural thesis on this subject. He said that in 1911, McCoy and Chapin described the *Bacterium tularense* as the cause of a plaguelike disease of rodents. In 1912, Chapin found that his own blood, following a febrile attack, caused agglutination of *Bacterium tularense*.

Tularemia occurs in nature as a fatal bacteremia of rodents, transmissible to man by blood-sucking insects or by inoculation into the skin of infectious material from infected rodents. It has been called deer-fly fever, rabbit fever, glandular type of tick fever, and O'Hara's disease. It was first reported clinically by Pearse in 1910 as deer-fly fever; and in 1919 Francis found the deer-fly to be a transmitter of the infection. In 1914 Vail reported a case of *Bacillus tularense* infection of the eye; and in 1915 and 1917 Sattler and Lamb reported two cases of "Conjunctivitis tularenensis" and traced these to infection from wild rabbits. In 1922 Francis reported his studies in a paper entitled "Tularemia, a new disease of man."

Tularemia occurs in man in six clinical types. These are the ulceroglandular, the oculo-glandular, the glandular, the typhoid, the meningitic, and the pneumonic types. The ulceroglandular is the most common. The symptoms are high temperature and regional adenopathy adjacent to a punched-out ulcer at the site of inoculation. The oculo-glandular cases present the same clinical picture with the primary sore in the conjunctiva. The glandular type differs from the first two types in that there is no demonstrable primary lesion. The typhoid type presents the clinical picture of typhoid fever and is distinguishable from it only

by serological tests. In the pneumonic and meningitic types, the symptoms of meningitis and pneumonia intervene during an attack of the typhoid type.

Pathologically, the primary lesion is a subacute infective granuloma. The regional lymph nodes present foci of caseous necrosis at the periphery of which there is a zone of epithelioid and fibroblastic granulation tissue containing giant cells of the Langhans type.

Bacterium tularense, ordinarily a short rod, assumes coccoid morphology in the old cultures. It is a strict aerobe, growing only on culture media containing cystin. In infected human subjects it is found in the blood stream, between the third and twelfth day of the disease. During the second week of the disease, agglutinins appear in the blood, reaching their maximum concentration in four to seven weeks. One attack confers permanent immunity. Frequently cross-agglutination of *Bacterium abortus* and *Bacterium melitensis* occurs, and in these cases the diagnosis is established by the proportionately higher titer of antitularense agglutinins.

The treatment of tularemia is symptomatic. Incision of the primary lesions is unwise. Foshay has recently produced a serum from goats and horses which he has used extensively with apparently good result, and which reduces the duration of the disease by one half.

The reaction of fear

Dr. C. J. Plonske (Faribault) read his inaugural thesis on this subject.

W. E. Camp,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 18, 1936

Dr. William A. Boyce, president

**When to probe congenital occlusion of
the lacrimal duct (round-table discussion)**

Dr. G. P. Landegger opened the discussion by stating that it was his prac-

tice to enter the duct with the largest probe available and that one or two treatments were generally sufficient. If this was not successful and infection was present he made an incision over the sac and cauterized it with trichloroacetic acid.

Dr. H. P. Merrill of San Diego said that he treated such conditions first by medication and pressure and after the child was six months of age by probing, if necessary.

Dr. M. N. Beigelman pointed out that the lacrimal duct in a baby has a slightly different direction from that of the adult. The duct runs directly downward in the infant.

Dr. Harry S. Gradle of Chicago called attention to the etiology of stenosis, that it is due to failure of union of the invaginating upper and lower epithelial sacs and that at times the entire obstruction is due to accumulation of epithelial cells in which there is no infection whatever. When probing is necessary this is done in his office without a general anesthetic.

Dr. M. E. Trainor stated that he prescribes a solution of zinc and adrenalin first, which frequently clears up the situation.

Dr. W. A. Boyce stated that he always probes through the upper punctum.

Dr. E. R. Lewis cautioned against slitting the canaliculus, for it interferes with the physiology of the lacrimal mechanism.

Dr. E. C. Jeancon advised probing after the infant is two to three months of age.

It was also stated by one of the members that a roentgenograph of the chest to eliminate persistent thymus should be made whenever a general anesthetic is anticipated in these cases.

Surgery of retinal detachment; the end results of various methods

Dr. Harry S. Gradle of Chicago (by invitation) presented a review of his six or seven years' experience in the surgical treatment of retinal detachment which was published in this Journal (October, 1936).

Discussion. Dr. Clifford Walker, in

discussing the paper, outlined his micropin-puncture method by which the galvanic current is used, and stated that 60 percent of cures could be obtained with galvanism in the first operation. At a second and third operation this percentage could be increased by 90 percent. Dr. Walker explained the mode of action of the galvanic current in producing a dissociation of ions and the production of minute amounts of potassium hydroxide about the micropin. He uses a short curved pin with which there is less danger of puncturing the retina on account of the curved direction in which it enters the sclera, and which produces a greater adhesive choroiditis.

Dr. Gradle, in answering Dr. Eugene Lewis, stated that he had seen two cases of spontaneous recovery. He further stated, regarding the relation of a minor injury to retinal detachment, that this was possible in the presence of strong contributing factors such as high myopia and choroidal lesions.

Harold F. Whalman,
Recorder.

ROYAL SOCIETY OF MEDICINE, LONDON

Section of Ophthalmology

February 14, 1936

Mr. Ransom Pickard, president

Vitamins in ophthalmology

Mr. John Foster said that vitamin A is variously described as affecting growth, epithelial structure, and as a general anti-infective agent. The claims as a general anti-infective agent are, he thought, exaggerated, as the infections associated with deficiency in its intake are of a special type, due to structural breakdown in membranes, without change in the general immunity. The specific effect of this vitamin is on the epithelium of the body (both mucous and squamous) without, however, excluding its effect on the nerve cells. Deficiency of the vitamin causes excessive keratinization, followed by local infection. Its source is "green things of the

land and sea," and in animals it is concentrated in the liver and retina. It is found in most animal fats, including cod-liver oil, butter, milk, and eggs, but is not present in lard. The main storage place of the vitamin is the liver.

A study showed that 16 percent of the population of the Netherlands have a subnormal vitamin-A reserve, and T. Moore got a similar result from tests in England. An extract of retinal tissue has an effect similar to that of carotene (a form of "A" vitamin) in maintaining growth and preventing xerophthalmia in rats deprived of vitamin A. In England hypovitaminosis is more common than frank vitamin-A deficiency, the latter being very rare. A minor deficiency affects the eyes of man and rats by producing hemeralopia. In rats this has been shown to be due to poor regeneration of the visual purple after exposure to strong light. This stimulus breaks down the visual purple into vitamin A and visual yellow. A more marked deficiency causes xerophthalmia. In the rat the corneal surface is bright, oily, and covered with fatlike plaques, or it may ulcerate, whereas with vitamin-G deficiency most of the pathological changes in the cornea are situated in the anterior-stroma layers, and ulceration does not occur. In the rat cataract does not occur as a result of vitamin-A deficiency. In man the condition of xerophthalmia is not dissimilar. Pillat has described many cases which he examined in China and the following three stages he called "pre-xerosis": slight loss of corneal luster, reduced sensibility, increase of xerosis bacilli with desquamation of epithelial cells. Xerosis proper is characterized by Bitot's spots, pigmentation and wrinkling of the conjunctiva, and keratomalacia.

With regard to the therapeutic use of vitamin A, Knypers has suggested that infantile eczema might be the result of vitamin-A deficiency, and that disease is often associated with phlyctenules. Vitamin A has been used in treating a number of eye conditions by Yudkin and his associate. They treated nine cases of toxic amblyopia, two cases of retinitis pigmentosa, five new cases of

phlyctenules, and three old cases with acute exacerbation. The amblyopia patients were given cod-liver oil three times a day, and 4,000 U.S.P. of vitamin-A concentrate intramuscularly twice a week. Four of them recovered from a vision of 1/10 to 1/4 within three months. The other five were still under treatment when the report was made and were improving.

Turning to vitamin B, the whole of this complex is found in fresh yeast, liver, milk, and to some extent in fruit. B2 (vitamin G) has been described as the heat-stable pellagra preventive, and (in rats) the antidermatitic vitamin. Its absence causes pellagra. Rats fed on a diet deficient in vitamin B showed: (1) muco-purulent exudates in the skin surface of the lids; (2) anterior interstitial keratitis, resulting in normal epithelium, and vascularization beneath it in the cornea; (3) proliferation of lens epithelium, and the breaking down of the fibers directly beneath the capsule. In some cases Morgagni's globules were added to this, and the lens was converted into an amorphous mass.

With regard to the therapeutic use of vitamin B in rats, in the case of six rats when cataract first appeared yeast was given, but the vascularized corneal nebula and cataracts remained, although the general condition rapidly returned to normal. One rat which developed unilateral cataract was immediately given vitamin G, and thereafter there were no further lens changes.

As to the use of vitamin G for human beings, nothing convincing has been found in its experimental administration, nor any suggestion that cataract occurs as a part of the syndrome of pellagra.

Vitamin C (the antiscorbutic vitamin) is found in lemons, potatoes, and most fresh foods, such as meat and milk, but both pasteurization and boiling spoils it. In the body it is concentrated in the suprarenal gland. Deficiency of this vitamin causes disease in the tooth pulp, also generalized hemorrhages. An appreciable amount of this vitamin can be detected in the lens and aqueous humor: in the cataractous

lens the amount is less than in the normal lens. A note from South Africa states that dislocated lenses, which are difficult to dissolve, dissolve more rapidly if fruit juice is administered.

With regard to the antirachitic vitamin D, this is found in cod-liver oil, but no common food stuff is rich in it. It has now been synthesized as irradiated ergosterol: of this it is easy to give an overdose. It is said to assist calcification, and so its administration might hasten arteriosclerosis: still, elderly patients have been given it over long periods without particular change in this respect. The deficiency effect on the eyes is indirect. The association of lamellar cataract with rickets, tetanic convulsions, and malformation of the teeth is well known. Its excessive administration to children who were taking sun baths at the same time has caused follicular conjunctivitis, this latter disappearing when the drug was withdrawn.

Vitamin E is known as the antisterility vitamin, and is found in green stuff, and in higher concentration in its usual source, namely, wheat-germ oil, which, however, does not contain vitamin C.

Finally, with regard to avoleum and phlyctenular keratitis, owing to the liability of phlyctenular keratitis to relapse in a varied degree of severity, the speaker decided to compare cases dealt with in the first three months of last year with those in the first three months of this year. Particulars were given of six of them. The first was an old case in a three-year-old, who attended during the whole of the year 1934, without benefit. Upon using avoleum, recovery ensued in seven months. The second patient was 11 years of age, and had multiple phlyctenules on the right limbus, cured in four months. The third, aged three years, had a central corneal ulceration. The child would not take cod-liver oil. Improvement set in immediately upon its being given avoleum. Recovery ensued in two months, but when the administration of the avoleum was stopped an attack occurred in the other eye. Treatment is still being continued. The condition of the fourth patient,

aged five years, was very poor: there was a very bad left cornea. Slight improvement had occurred while avoleum was used. The patient is still under treatment. The condition in the fifth case was also poor: there was a phlyctenule on the limbus in the 6-o'clock position. After a fortnight's treatment the ulcer was healed, and two months later still remained healed. The last patient, aged 12 years, had a phlyctenule on the left limbus, moderately severe. Recovery ensued in 21 days.

Discussion. Mr. A. C. Hudson said that he gives vitamin D in cases of myopia. His impression for a long time has been that it is good to give that vitamin for this condition.

Mr. Lindsay Rea said that for a long time he had been giving to his myopic patients milk, calcium, and vitamin D. In a school of 400 children, all living under the same conditions, there were a number who had myopia, between the ages of 12 and 15 years. One of these in particular would not drink milk at all but in the summer ate a good quantity of ice cream. While she took no milk she was adding to her myopia at the rate of .50 D. every six months. The worst case of keratomalacia he had seen was in an Indian student, who, in the first part of his residence in England, kept strictly to the kind of food he had been having in India: he was physically a miserable specimen. His corneae were wrinkled, and around the margin was vascularization. After he had been prevailed upon to take a diet suitable to the English climate, the corneae recovered completely.

Allergic tests in external eye conditions

Mr. Arnold Sorsby and Miss L. R. Henham said that the question of allergy in man is bound up closely with the advances in the science of bacteriology. The introduction of vaccines led to the discovery that increasing doses of organisms could be tolerated by human beings if the increase were properly regulated. There is also, in the

human being, an increasing intolerance of hypersensitiveness to the introduction of foreign protein into the system. When a foreign protein is introduced into the body there might be (1) no effect, or (2) immunity might be induced, or (3) a hypersensitiveness or anaphylaxis might occur. In some individuals allergy is an inborn tendency, in others it was an acquired condition. Many believe that immunity is something in opposition to hypersensitiveness, but it is not so: a person may be hypersensitive to some substance and at the same time immune to others. If the body is sensitized to a foreign protein, the eye takes part in the responding sensitization, and the inflammatory reaction in the eye can be explained as part of the response of the body to proteins of nonbacterial origin. Very rarely can spirochaetes be found in the cornea. The course of interstitial keratitis is different from that following the experimental introduction of spirochaetes into the cornea. The treatment of syphilis does not give the same results in interstitial keratitis as it does in other syphilitic affections. A physician had episcleritis, the cause of which was unknown. He was sensitive to pollens, feathers, and so forth. He followed a diet which was free from food substances to which he was sensitive, and he became free from his episcleritis.

There is little material available on which it is possible to build up a case in favor of an influence being exerted by allergy in eye conditions. Many suggestions have been made which are attractive, but they lack experimental and clinical support. One suggestion was that keratitis is a result of sensitization of the cornea by the débris thrown out in the course of ulceration, the broken-down tissue acting as a foreign body, and sensitizing the cornea. Many efforts have been made to prove that cataract is an allergic condition, that is, that cataract is allergic to lens protein itself, but the data on which the suggestion was advanced were unreliable.

If cattle are inoculated with cowpox vaccine and the cornea is vaccinated, a

sloughing ulcerative keratitis is produced, but it is not so severe as in the control animals which have not been previously vaccinated.

It seems that there is a possible scope for ocular allergy in trachomatous keratitis, interstitial keratitis, cataract, and sympathetic ophthalmia.

At the White Oak Hospital, Swanley, 292 cases were tested with regard to their protein sensitivity; these consisted of 60 cases of phlyctenular ophthalmia, 67 of conjunctivitis, 48 of trachoma, 81 of blepharitis, and 36 of interstitial keratitis. In all the 292 cases there was only one positive result.

With regard to proteose treatment, the problem surrounding this is still unsettled. H. W. Barber (dermatologist) has said that it is unnecessary in an allergic patient to find out what the particular substance is to which he is sensitive, for the patient produces his own antibodies, and they are excreted in the urine. If what Barber said is true, it represents an advance. Martin and Mills published a paper reporting 46 cases of eye conditions which they had treated with proteose, these conditions ranging from uveitis and extensive vitreous infiltration to a chronic panophthalmitis, and all the 46 did extremely well. This paper, which was read before the American Medical Association, was severely criticized, as no evidence was submitted in proof that the patients were really allergic.

Discussion. Mr. F. T. Ridley said he was sorry no allusion had been made in the paper to the recent work of Julianelle on this subject. It was shown that the application to the eye of protein without first scarifying the eye gave only negative results. It had been shown that by injecting the cornea for some weeks with a foreign protein, such as egg-white, or the protein of the pneumococcus, one could sensitize it to that protein: and if one kept provoking allergic response in that way, one produced a pannus and a revascularization on that keratitis like the vascularization seen in clinical ophthalmology.

(Reported by H. Dickinson.)

CHICAGO OPHTHALMOLOGICAL SOCIETY

February 17, 1936

Dr. Robert Blue, president

Hemophthalmus after contusion

Dr. Bertha Klien presented a boy 14 years of age, who sustained a contusion of the left eye one year ago. At that time the left vision was 8/200. There was hyphemia and a traumatic iris sphincter paralysis, but the fundus appeared normal. During the following 10 days a hemophthalmus developed and vision decreased to light perception and faulty projection. The intraocular tension rose temporarily to 46.0 mm. Hg (Schiötz) and an iridocyclitis developed. After two weeks a fresh vitreous hemorrhage occurred. The eye was extremely painful for two weeks. The left vision then began to improve. The patient was kept quiet, sodium iodide was given internally, and local treatment of atropine and heat. At present the corrected vision is 0.5 plus 2, and J. 1. There still remains a slight distortion of the pupil, and a moderate amount of fine and coarse vitreous floaters. A hemophthalmus in young people, despite loss of light perception, has usually a good prognosis, as the absorption of the hemorrhage may be very rapid. Meller has shown that aside from the perivascular lymph spaces of the retina it is mainly the unpigmented epithelium of the flat portion of the ciliary body that aids the rapid absorption of vitreous hemorrhages.

Old contusion

Dr. Bertha Klien said that this boy, 18 years of age, had suffered a contusion of the left eye 10 years ago, followed by progressive loss of vision. Corrected vision is now 8/200. Externally the left eye is normal. The left fundus presents two kinds of lesions: (1) ill-defined, gray streaks which extend from the region of the posterior pole toward the periphery and are located underneath the retina; (2) streaks and groups composed of very small, in places dustlike, rather well-defined, yellowish white flecks, which

lie also underneath the retina or in its most posterior layers, as seen with the Gullstrand ophthalmoscope. Each of these areas is at one point at least in contact with one of the gray streaks. There is no gross choroidal rupture. The gray streaks, having a radial and not a concentric direction, cannot be connected directly with a rupture, but a choroidal hemorrhage perhaps of a more diffuse character at the time of the injury is probable, leaving the deep gray lines of organized material between choroid and retina. Also a reattachment of a retinal detachment could be considered, as this may leave similar gray lines. The interpretation of the yellowish flecks is more difficult. They probably consist of fatty granular cells derived from the pigment epithelium and deposited in small and large groups along the inner surface, and in the outer layers of the retina.

Results of orthoptic training

Dr. J. L. Bressler presented two cases. A woman, aged 51 years, was first seen in February, 1934, with a history of the eyes' turning in since her fourth year of age. She had worn glasses for two years, and for the past year had had orthoptic treatment. Upon examination it was found that she had an alternating esotropia measuring, with glasses, 26 degrees, and without glasses, 35 degrees. The vision was 20/25 in each eye. Fixation and motility were good; fusion absent. Orthoptic treatment was tried for several weeks, but the eyes showed a tendency to get worse, the angle at times becoming as high as 45 degrees. On April 27, 1934, a recession of the internal rectus of the left eye was performed, with Reese resection of the external rectus. On May 21st, the remaining deviation varied from 4 degrees to 20 degrees (with glasses). About two weeks later orthoptic treatment was started, and on August 27th, the eyes were parallel with and without glasses. Fusion of all grades including stereopsis is now present. Vision with glasses is 20/15 in each eye.

The second case, in a 28-year-old woman, was admitted to the orthoptic

clinic with a history of the eyes turning in since her fourth year of age. She had had no treatment and had never worn glasses. An alternating esotropia of 30 degrees was found. Vision was O.D. 20/30, O.S. 20/25. Motility and fixation were good. Orthoptic treatment was given from February 11, 1935, until March 29th, without improvement, at which time recession of the internal rectus with resection of the external rectus was performed. On April 17th, the eyes were parallel and orthoptic treatment was resumed. By April 29th, simple fusion had been developed. Now all grades of fusion with stereopsis and parallelism are present.

Anophthalmia

Dr. Carl Apple in showing this patient, said that anophthalmia is an aberration in development, the failure of the primary optic vesicles to bud out. The abnormality is encountered in healthy, well-formed children; not uncommonly in association with other malformations such as harelip and supernumerary digits. The lids, though small, are usually well formed; they may be adherent to their margins. The orbit is smaller than normal, and lined throughout with conjunctiva. Digital examination reveals a small, hard, mobile nodule near the extreme apex. The lacrimal puncta may be absent in one or both lids, but the lacrimal gland is usually present. In these cases the optic nerve has never been found to enter the orbit; it either ends as a cone or fibrous filament at the optic foramen, or it is entirely absent, together with the chiasm. The olfactory lobes and cerebral hemispheres have also been found deficient, which is of interest in that they, like the primary optic vesicles, are outgrowths of the anterior cerebral vesicles. It is the failure of the primary optic vesicles to bud off from the anterior cerebral vesicle which seems to be the usual cause of anophthalmia. Microscopic examination of the nodules found in the orbit has shown them to be composed of subsidiary parts of the eye, of mesoblastic origin. A capsule of fibrous tissue like the sclerotic contains choroidal tissue,

but no retina. There is complete absence of the essential nervous elements constituting the eye. The presence or absence of the essential nervous element in the nodule in the orbit can be determined with certainty only by microscopic examination, so that clinically it becomes very difficult to distinguish between true anophthalmia and very high degrees of microphthalmia.

Comments on orthoptic treatment in strabismus

Dr. J. S. Bressler read a paper on this subject, published in this number of the Journal.

Discussion: Dr. George Guibor said that Dr. Bressler had emphasized the salient point on orthoptic training when he said, "One may ask why we should bother with the tedious and time-consuming course of orthoptic treatment when the same results can be more quickly obtained by surgery." He had replied that the same results cannot be obtained by surgery alone as can be obtained by orthoptics and believes that amblyopia and stereoscopic ability are not improved by surgery. Yet if one operates upon patients with little fusion ability and reexamines these patients after the squint is eliminated, he will find some with stereoscopic vision that has developed over a period of a few weeks or months. There are therefore exceptions to this rule. Another important point which Dr. Bressler emphasized is that all cases cannot be improved by orthoptic training. A second point not mentioned in the paper is that all cases cannot be corrected easily by surgery, and that there are definite indications for orthoptic training. One must have a definite classification of strabismus in mind in order to differentiate surgical from nonsurgical cases. Such a classification must embody the causes of the strabismus and those associating factors that must be eliminated to produce a recovery from the deviation and from the loss of binocular vision.

Dr. Thomas D. Allen said that for the past year he had used the rotoscope on occasion both for diagnosis and treatment. In speaking of the use of any

instrument one must bear in mind that the after effects of its use may or may not be due to the instrument. Especially is this true when it is used seldom. It would be scientific to use it only after thorough examination and diagnosis; and if the condition were found to be rather constant over a reasonable period of time, such as two years, then one might draw conclusions. However, the results might have occurred without the use of the instrument. Also, it is conceivable that the instrument might be used in such a way as to aggravate the condition, and yet the condition become more normal.

The instrument as used, about once a week for 20 to 30 minutes, does not appear to aid greatly in reducing the actual muscle imbalance. In some cases a hyperphoria of several degrees seems to be reduced. One woman, 31 years of age, had been wearing for two years a small cylinder with 2 degrees prism base down in the left eye, and before that had worn 1.5 degrees prism base in and 1.5 degrees base down. The refraction needed practically no change. There was 3.5 degrees of exophoria for distance, and from 3 to 3.5 degrees of left hyperphoria; for near, 13 degrees of exophoria and 4 degrees of left hyperphoria, due to a weakness of the left inferior rectus. Practically no change was made in the glasses and she was quite comfortable for over two years. Then there was a slight change in the astigmatic axis. The muscle balance was about as before except a slight increase in the exophoria (7 degrees for distance and 15 degrees for near). She agreed to try using the rotoscope and as a result her hyperphoria seems now to be only 1 to 1.5 degrees, and the exophoria seems to be somewhat less.

Another case, a nine-year-old girl, had a divergent squint when first seen with high-grade mixed astigmatism and vision of 20/50 in each eye, divergence of 20 to 25 degrees of arc, either eye fixed, and no fusion. Four months later there was no improvement and orthoptic treatment was unsuccessful. Three years after the first visit there was divergence of 30 degrees of arc, no gross change in refraction, and very slight

improvement in vision. On December 27, 1935, resection and advancement of the right internal rectus was performed, with subconjunctival tenotomy of all main fibers of the externus. There was questionable overcorrection at the time of operation. At the first dressing the eyes were straight, but within a few days slight divergence under cover developed. The rotoscope was used almost daily from the fifth postoperative day. After two weeks there was 25 percent fusion on the Keystone charts. Since that time the patient has used the rotoscope, at first twice a week, more recently once a week. She still has excellent fusion, excellent convergence and divergence, but under cover the eye still diverges some 10 degrees of arc.

He had yet to see a single case in which operation was certainly avoided by the use of this instrument.

Dr. W. F. Moncreiff asked why it is, that when orthoptic training is applied routinely in all cases of concomitant convergent squint, in some cases the squint angle remains unchanged, while in others the angle is reduced or even disappears? As a basis for the accurate analysis of this problem, we need a simple but adequate classification of the types of concomitant convergent squint. In the first place, we must rigorously exclude all cases of muscle palsy, whatever their stage. Having done this, we will find that the classification which Worth employed is correct and is preferable to more complicated, but also superficial and artificial classifications more recently proposed.

We see at once that there are two types of situation in which orthoptics is inapplicable or unavailing: (1) the true or essentially alternating squint; (2) the nonalternating squints in which the vision of the amblyopic eye cannot be improved by any feasible therapy beyond 0.2. A third type is found in older children with either accidentally alternating squint or nonalternating squint in which the squinting eye has vision of 0.3 or better, including some neglected cases in which, over a period of years, with a fixed squint angle, secondary anatomic changes amenable only to surgery have occurred in the

muscles. While in this group orthoptics is useless preoperatively, it has a definite place as a postoperative measure, as Dr. Bressler has so well stated. With this latter group of children, however, at early ages, especially within a few months of the onset of the deviation, orthoptic training should be able to achieve its highest percentage of good results.

Dr. J. L. Bressler (closing) said that too much is expected of orthoptics when it is used alone in the treatment of strabismus. It is true that many cases, properly selected, can be corrected, but the greater number will eventually come to surgery. In this group orthoptics will play a very important role, not only in developing fusion or improving vision, but also in completing a cure in many cases of undercorrection and overcorrection, thereby avoiding the necessity for further surgery. While the following statement may call forth some criticism, he could not help feeling that when the attempt is made to correct strabismus with surgery without previous attempts to improve vision and develop fusion, or postoperative orthoptic treatment, the end results in a great number of cases will be cosmetic only. The patient still continues to use only one eye, and suppresses the previously deviating eye, although the operation may have resulted in parallelism.

Robert von der Heydt

COLORADO OPHTHALMOLOGICAL SOCIETY

February 15, 1936

Dr. E. M. Marbourg, presiding

Striate retinal hemorrhages in the papillo-macular region

Dr. Leo L. Davis presented Mr. B. D., aged 60 years, who had noticed poor vision in his right eye three weeks previously. Striate hemorrhages were seen in the papillo-macular region of the right eye, outlining the nerve-fiber layer. There were three round white

areas of exudate. The left fundus was normal. There was no abnormal angiocl sclerosis. Physical examination was negative except for the poor condition of the teeth. Blood pressure was 160 systolic; urinalysis normal.

Discussion. Dr. Edward Jackson mentioned the element of eyestrain as a factor in causing retinal hemorrhages. In this case, the age of the patient suggested vascular disease as the cause, although hemorrhages are often seen in young individuals without any apparent reason.

Dr. E. R. Neeper thought that this was a case of hemorrhage due to focal infection in the teeth.

Dr. W. H. Crisp observed that hemorrhages may occur anywhere in the body at various periods of life and after certain diseases, such as influenza. It is not known whether these are due to changes in the vessel walls or in the blood.

Dr. E. M. Marbourg suggested the use of ophthalmic thyroxin to clear up hemorrhages into the vitreous. He had found marked improvement of vision in cases of disseminated choroiditis following its use.

Blindness in an infant operated on for meningocele

Dr. G. H. Hopkins reported the case of a baby, aged 11 months, who had been operated on for a meningocele. Apparently the child was entirely blind although the pupils reacted normally and the nerve heads appeared normal. There was a refractive error of six to eight diopters of hyperopia. The question was raised as to whether glasses should be prescribed.

Discussion. Dr. Edward Jackson expressed the opinion that there would be no advantage in putting on glasses, since there is a normal decrease in hyperopia of from two to five diopters in the first four to six years of life. The pathology was probably in the occipital lobe.

Edna M. Reynolds,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis
WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver
EDWARD JACKSON, Consulting Editor
Republic Building, Denver
HANS BARKAN
Stanford University Hospital, San Francisco
HARRY S. GRADLE
58 East Washington Street, Chicago

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis
PARK LEWIS
454 Franklin Building, Buffalo
C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City
M. URIBE TRONCOSO
350 West 85th Street, New York
JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York
EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

Address original papers, other scientific communications including correspondence, also books for review and reports of society proceedings to Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.

Exchange copies of medical journals should be sent to Dr. William H. Crisp, 530 Metropolitan Building, Denver.

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis. Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the manuscript editor. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

NERVE STRAINS OF VISION

Eye strain was a term brief and suggestive; but it concentrated attention too exclusively on the eyes. This was not bad, so long as the strain of accommodation or convergence, and the pathologic changes thus caused, were the chief departures from health that claimed attention; and the correction of refractive errors by glasses was supposed to be the only needed remedy. But a broader understanding of visual deficiencies and ocular disease justifies a more inclusive term to be applied to them.

Treacher Collins pointed out that macular vision and binocular vision and movements were developed together by our "arboreal ancestors," and are peculiar to man and the most nearly related primates. Prof. Elliot Smith showed that with these developments of human vision came the brain development of the cerebral convolutions, which he calls the neo-pallium, the chief organ of human intelligence. It cannot

be supposed that these developments are merely accidental and coincident. The reasonable view is that human vision rendered possible so many new coordinations and applications of the sense of sight that these required the greater mass and elaboration of nerve cells and coördinating fibers, and that a greater mass of nerve centers was thereby necessary.

It is a general law of evolution that organs and structures more recently developed and organized are more liable to variation and defect. They are less perfectly adapted to the new functions they have to perform; and are more liable to give way under the work they have to do, more liable to disease and disability, and likely to become a source of pain, or confusion. The new powers can be a great source of pleasure and achievement; but they can be a source of pain, and are especially liable to defect, or to become unequal to all that might be expected of them.

It was no fancy, or fad, that newly

discovered errors of refraction needed correction by glasses; or that heterophorias, or other defects of binocular movements demanded consideration. Nor was it merely that so large a proportion of the race had suddenly devoted themselves to reading, drawing, fine needlework, and mechanical trades that required prolonged and accurate near vision. All of these things had their share in causing nerve strain. But a more important factor is the exercise of the exact, elaborate coordinations of macular vision with all the other senses, the values and employments of which were enormously increased by coordinations with exact binocular vision. These new functions for the nerve centers are a great contribution to what Sherrington has called "The integrative function of the nervous system." These new structures and functions are not exempt from the presumption, that because they are recent they are more liable to defect; and more likely to be starting points for pain and dysfunction of various kinds.

The disorders of the nervous system, starting in the coordinating mechanism, that brings the greatest benefits from improved and applied binocular vision, have received but slight notice in the literature of ophthalmology. The important coordinations of the central nervous system, created or modified by the development of binocular vision, have been very little studied. It is certain that the symptoms of nerve strain from the use of the eyes depend on other things than over-use of accommodation and convergence. The recent paper of Virgil Wescott (this Journal, 1936, v. 19, p. 385) shows that asthenopia following head injuries is not generally due to either loss of accommodation or paresis of the extraocular muscles.

Old people who have been great readers, who have come to rely on reading for the sole means of recreation, who still have good acuteness of vision, and no serious loss of power in their ocular muscles, will begin to read less and less, or give it up altogether. Under the senile involution of the nervous system they quit reading because it is too hard for them. Without other occupation

they sit idly by, waiting for the end. Not only the ocular organ of vision may suffer from over use. The central nervous mechanism, which has been developed for vision, also fails. Any understanding of nerve strain arising from use of the eyes, must take into consideration the strain of the part of the central nervous system actively engaged in the process of coordinating the visual impressions with the impressions of the other senses, and with the motor coordinations which have to do with the use of vision in the general orientation and equilibrium of the whole body.

Edward Jackson.

THE RETICULO-ENDOTHELIAL SYSTEM

For something over twenty years the literature of histology and pathology has contained frequent references to an entity bearing the high-sounding title of "reticulo-endothelial system." The subject has been occasionally mentioned in ophthalmic literature, but usually without extensive discussion or explanation; and it may be conjectured that few ophthalmologists can lay claim to more than a very hazy understanding of the structures and principles involved.

In 1869 Virchow observed that the lymph nodes fixed pigment granules arising from tattooing of the skin; and Cornil demonstrated that the granules were localized in the cells of the reticulum of the nodes.

In 1892 Metchnikoff, in his work on the comparative pathology of inflammation, divided phagocytes into microphages, represented by the polynuclears, and macrophages, fixed and mobile; the former being the large mononuclear cells of the blood, and the latter including the endothelial cells of the lymph nodes and of the sinus of the spleen as well as a number of other connective-tissue cells.

In 1913 Kyono coined the word "histiocyte" to include any cellular element which fixed vital stains; all such elements being of mesenchymatous origin. To these cellular elements, which corresponded to those described by Metch-

nikoff, Aschoff applied the designation "reticulo-endothelial system."

Vital staining is the elective staining of certain anatomic elements, obtained by injection or absorption of coloring matter in a living animal. Langeron has described it as an accumulation of stain in special portions of the cell.

By several authors a relationship has recently been traced between the reticulo-endothelial system and the perversion of bodily defense mechanism which we know as anaphylaxis. In general, it may be remarked that there is a tendency to associate with the reticulo-endothelial system, in a rather vague way, some vices and a number of virtues, including especially the process of defense against such chronic diseases as tuberculosis.

The cells of the reticulo-endothelial system are found throughout the entire organism, but particularly in the connective tissue of the liver, spleen, bone marrow, and adrenals. Beside phagocytosis, these cells have the function of taking up other foreign material, including bacteria and cellular debris. Such activity is increased during infections, and is perhaps in some mysterious fashion reduced or absent in the disease known as agranulocytopenia. Isaac and Bieling have credited these cellular elements with playing an important part in the formation of antibodies.

Németh (*Klinische Monatsblätter für Augenheilkunde*, 1936, v. 96, p. 613) recently presented to the Hungarian Ophthalmological Society a monograph in which he described animal experiments as to the part played by the reticulo-endothelial system in suppurative inflammations of the cornea. He inoculated the corneal tissue of rabbits with bacteria, at first using pure strains of individual bacteria, but later finding mixed infection equally satisfactory. The vital staining was obtained by intravenous injection of a solution of trypan blue.

The histiocytes (by which term Németh understands the mobile members of the system which are found in connective tissue) failed to appear in cases of mild keratitis, but were always present in violent inflammations. An

injection of 10 c.c. of a one-percent solution of this stain was sufficient to demonstrate histiocytes twenty-four hours after the injection, but a greater dose of the stain was necessary in order to obtain vital staining of fixed cells and of the endothelium of the inflamed cornea even as late as the eighth or the tenth day of the inflammation.

If the inflammation was sufficiently severe, the migration of the histiocytes into the cornea began in about seventy-two hours and then rapidly increased. On the fourth or fifth day the suppurative inflammation of the cornea began to be surrounded by a blue ring, at first only visible under magnification but later with the naked eye. This was produced by the stain carried by the histiocytes which collected around the infiltrate in large numbers. On the eighth day of the inflammation the histiocytes became visible by means of the slitlamp in the form of finer or coarser granules in the cornea. The number of granules increased noticeably with the beginning of vascularization.

After fifteen or twenty days of inflammation the histiocytes began to predominate, and the leucocytes gradually assumed less importance. Even the reticulo-endothelial cells might ultimately undergo destruction if the task assigned to them was too great.

Németh does not agree with authors who have attributed to the leucocytes the duty of conveying nourishment to the fixed cells during the process of repair after injury. He feels that this function more probably pertains to the histiocytes.

The literature of the reticulo-endothelial system teems in complications, in speculative hypotheses, and in conflicts of opinion. There is inadequate agreement as to which cells are properly to be included. The system has been accused of giving rise to local formation of granulated blood cells, and of serving as a basis for development of lymphocytes. In infectious diseases the reticulo-endothelial cells of the liver and of the abdominal lymph glands are credited with phagocytosis of disfigured erythrocytes. Its cells store iron liberated from disintegrated red blood cells. They

have a great affinity for lipoids. So far it has not been possible to demonstrate that they store and transform proteins. In tuberculosis the attempt of the monocytes to destroy the tubercle bacilli usually fails and it has been suggested that tubercle bacilli live as parasites within the monocytes.

How much of the knowledge which is being accumulated concerning the reticulo-endothelial system will ultimately lead to advance in therapeutic methods? Much has been said of blocking the reticulo-endothelial system by injection of colloidal metals, or by stimulation with roentgen or other radiation, and of measures for decreasing the function of the histiocytes. In such a subject the ophthalmologist is interested chiefly because of his conception of the eye as an integral part of the whole organism. Little by little, investigations like that of Németh add to the accumulated understanding of the processes of local and general resistance and immunity.

W. H. Crisp.

THE NEW YORK MEETING OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

The good judgment of the Council was again proved by the outstanding success of the recent convocation in America's premier city. One would be tempted to use such expansive words as colossal and magnificent had the recent political contest not worn thin all English superlatives.

Though numbers alone are by no means a good criterion of the value of a meeting, such an attendance as the October gathering is astonishing. By Wednesday night, the registration, as announced by the president, was 1711, exceeding by more than 500 the count at any previous session. As the president-elect expressed it, the infant organization of thirty years ago had grown into a giant.

Now that the Society has become so large, the question is what to do with it. As the secretary-treasurer said at the business meeting, we do not want to lose the intimacy of our society by the

necessity of housing and carrying on our widely diversified activities under separate roofs. We want to try to avoid auditoriums if possible, but there are few hotels that can accommodate us.

Many cities wanted the 1937 convention, and a choice was difficult because of this and other considerations, such as suitable geographic and climatic localities. After much deliberation, Detroit was selected. Many of our members have kept green the memories of the last meeting there ten years ago. Among the pleasant extracurricular activities were the official excursions on the river and certain less official night sallies across the Detroit River by our more adventurous members.

We shall be led to Detroit by Dr. Lee Wallace Dean who, having ably served his initiation as president-elect, will act as president for the coming year. To succeed him has been chosen a man who has been a guiding spirit, an indefatigable worker, and an originator of many of the best features of the Academy—Dr. Harry Gradle.

It was he who suggested the instructional courses as a part of the program and who has labored long and valiantly as secretary of the ophthalmic section. The instructional element of the Academy has been its unique feature and there is undoubtedly much truth in the remark of a member, overheard in one of the Waldorf elevators, when his companion commented on the vitality of the Academy, "If you want to know the cause, it's the courses."

Another important contribution of our president-elect was the arousing of interest of our former Surgeon General Ireland in establishing cooperation between the Army Medical Museum and the Academy, so that the present mutually satisfactory arrangement was made by which specimens furnished to the Museum are sectioned and studied and report and specimens returned to the senders. From this grew the loan collections of pathologic material which are borrowed for study by our members with increasing frequency. We congratulate Dr. Gradle on his election and the Academy on their fine selection.

As first vice-president of the ophthal-

mic section Dr. Bernard Samuels was chosen. This also was a meritorious choice, for Dr. Samuels has acquired an enviable reputation as chief of the ophthalmological department of Cornell University and as one of our leading ophthalmic pathologists. Under the guidance of these men the next session will be one that our members cannot afford to miss.

We arrived Monday morning in time for the opening gathering, where we listened to excellent addresses by our president, Dr. Frank Burch, and by our honored guest, Sir John Herbert Parsons. To greet later this famous ophthalmologist and courteous gentleman was a never-to-be-forgotten experience. He modestly disavowed the many eulogistic expressions of speakers and toastmasters during his visit but no laudatory comment could have done more than justice to our distinguished visitor.

It is possible to discuss only a few high spots of the meeting in an editorial of reasonable length. We regard the teachers' section as of sufficient importance to be treated in a separate editorial in the next issue. Let us here add another word about the courses. They seem to be continually improving. Probably the natural teachers are being discovered and the type of course that lends itself to an instructional period is being learned. The writer attended six courses, all of which were found to be interesting and instructive. In one the cerebroophthalmic relationships were portrayed with unusual clarity, beautiful charts and specimens being used for illustration; in another a new operation was clearly and convincingly described; in still another, one of the best lectures we have ever heard on orthoptics was given. In accompaniment there was a complete exhibit of apparatus which was disinterestedly demonstrated by numerous trained technicians. It is this kind of exhibit we should like to have permanently set up in New York or elsewhere. Possibly some such organization as the National Society for the Prevention of Blindness might be interested, for orthoptics has importance in their work and the profession needs unprejudiced demonstrations in trying to evalu-

ate orthoptics. It has been more handicapped than helped by high-powered salesmen who tend to overestimate to the prospective buyer the virtues of the particular instrument that he is trying to sell and fail to point out its limitations. No one instrument can cover the field any more than one camera will fill all photographic needs. Possibly an Academy grant to aid in such a plan for permanent demonstration might be made available.

There is space for only a few more lines and these must be devoted to the banquet, over which our well-loved president, Dr. Frank Burch, presided. Some had feared that the distractions of New York would reduce the attendance on this occasion, but such did not prove to be the case. The large and beautiful hall was filled to capacity, the program was excellent, the banquet delicious. Our charming British guest expressed the feeling of all when he said that the banquet scene spread before him was wonderfully beautiful, but to him—and this was obviously from his heart—most beautiful of all was the conjunction on the platform of the American and British flags.

Lawrence T. Post.

BOOK NOTICES

The eye and its diseases. Edited by Conrad Berens, M.D. Cloth binding, 1274 pages with 436 illustrations, some in colors. 1936. Philadelphia and London, W. B. Saunders Co. Price \$12.00.

The following "Foreword" to this volume, probably the last from Dr. Wilmer's pen before his sudden death in March, was rejected by the publishers because of his decease. To Journal readers, however, it will have lost nothing of its significance by the fact that that pen was laid down before the publication of the book.

FOREWORD

Samuel Johnson said: "There are two things which I am confident I can do well; one is an introduction to any liter-

ary work, stating what it is to contain, and how it should be executed in the most perfect manner." Such ability and happy confidence, which are sadly lacking in the writer of this foreword, are really necessary to do justice to this ophthalmologic thesaurus. It contains seventy-three chapters contributed by different authors from other parts of the world, as well as from the United States—which gives it an international character. It thus presents in a concise, practical, and authoritative form the experience gained in the clinics and laboratories of the world. This work is truly encyclopedic; for it covers all phases of ophthalmology from its earliest history to present-day ophthalmologic jurisprudence. In this work are discussed the latest advances in the science and art of ophthalmology—aniseikonia, radiotherapy, ocular bacteriology, avitaminosis, orthoptic training—the latest procedures, and therapeutic measures. In addition, it is well and profusely illustrated.

This modestly called "Eye and its diseases" reflects much credit upon its dynamic editor, Dr. Conrad Berens, and upon his collaborators. They deserve the warmest congratulations. To them, the student and teacher of ophthalmology and practitioner of general medicine owe a great debt of gratitude for giving them this fine cross section of the world's view upon the many fascinating problems of ophthalmology.

As "good wine needs no bush," so a good book needs no eulogy.

William H. Wilmer.

This book has been written by 82 ophthalmologists, most of whom are properly ranked as "international authorities," regarding the subjects on which they have written. It is inscribed "To my first instructors in ophthalmology, George E. de Schweinitz, M.D., and my father Conrad Berens, M.D."

The "Diseases of the eye" by G. E. de Schweinitz has run through ten editions in the last 44 years, keeping its leading position by the careful revisions of its author. The editor and publishers of this new work may reasonably have brought it forward as a worthy succe-

sor to the books of de Schweinitz and Fuchs. But it may well attain a wider circulation and influence than any of its predecessors. Specialization has been forced, by the expansion of medical science and medical art; and this goes on more rapidly in each specialty than it ever did before in the general fields of medicine and surgery.

The editor, in his Preface points out: "Because of the development of the science of medicine and the inter-relation of its branches, the scope of ophthalmology has broadened to a degree that has made it necessary for ophthalmologists to specialize in certain clinical or scientific aspects of their work. This has made it impossible for any ophthalmologist to write as authoritatively on all aspects of diseases of the eye as on the limited field to which he has devoted his special interest." This thought underlies the plan of the book, and is displayed in the table of contents, in its division into 14 parts and 73 chapters. Sometimes a single chapter is the work of two or more writers; as chapter 29, by F. A. Williamson-Noble and Arnold Sorsby and Ida Mann of London, and C. H. Usher, of Aberdeen, Scotland.

One chapter is the work of two writers, now gone: William C. Finnoff on "Tuberculosis of the eye," and William Holland Wilmer on "Therapeutic use of tuberculin." This chapter, in four pages, records their important conclusions from many years of experimental and clinical observation.

Chapter 50, on "Movements of the eyeballs and their anomalies," comes from C. D. Verrijp, of Leiden, Holland, Luther C. Peter, of Philadelphia, and W. A. Pugh, of London. It deals with Movements of the eyes, Motor anomalies of the eyes, and Orthoptic training. Part XI deals with the Hygiene of the eyes, including the Prevention of blindness. Part XII is given to Immunology, 12 pages. Part XIII takes up Legal aspects of ophthalmology and Part XIV, Laboratory diagnosis. Each chapter ends with references, which vary in number from a half dozen to one hundred and sixty-two.

A review of this book brings pleasant surprises; as one meets among the con-

tributors the names of Browning, the bacteriologist of Moorfields Hospital, Comberg of Rostock, Lindner of Vienna, McKee and Whitnall of Montreal, Traquair of Edinburgh, Van der Hoeve of Leiden, and Marx of Rotterdam.

This work, rather than as a successor to de Schweinitz, or Fuchs, might be compared to the four-volume "System" of Norris and Oliver, or the three editions of the Graefe-Saemisch Handbuch. A close inspection of it, from the five-page list of contributors to the three-column, 40-page index, leaves outstanding impressions of the enormous extent and swift progress in the development of ophthalmology, and the intelligent, minute, and thorough work of the editor.

Edward Jackson.

Awerbach jubilee volume. Published by the State Publishing Department of Biologic and Medical Literature, Moscow-Leningrad. Cloth binding, 593 pages, 1936. Price not stated.

The Awerbach jubilee volume is a collection of contributions by "pupils, colleagues, and friends," issued in commemoration of forty years of "scientific, pedagogic, and social activity," by Michail Josiphovich Awerbach, editor of *Sovietskii Viestnik Ophtalmologii* and chief of the Helmholtz Institute of Didactic and Clinical Ophthalmology, which is described as the largest eye hospital in Europe.

Awerbach, the introduction states, is one of the Russian scholars who honestly joined in the building of Russia's new social order. He directed ophthalmologic activities and served in an advisory capacity on practically every committee planning Russia's vast public-health program. His teaching activity began in 1910 as professor of ophthalmology on the faculty of the medical courses for women. At present he is professor of ophthalmology at the Second Moscow Medical Institute. In the Helmholtz Institute he directs the training of thousands of ophthalmologists.

In addition to contributions by a large number of Russian ophthalmol-

ogists the volume contains articles by Arruga, Avizonis, Hirschfeld, Sattler, Seefelder, Igersheimer, Morax, Polack, Sourdille, and Meller. An outstanding feature of the volume (as also of *Sovietskii Viestnik Ophtalmologii*) is the number of articles dealing with the role of ophthalmology in furthering cultural advancement of the masses, and the shifting of the emphasis of ophthalmologic effort from the individual to the group. Brief abstracts of the papers will be found in the abstract department of the American Journal of Ophthalmology.

Ray K. Daily.

Lecciones de Oftalmologia Clinica Especial. By Dr. Manuel Marquez. Paper binding, 489 pages, 490 illustrations, some in color. Madrid, S. A. Blass, 1936. Price 40 pesetas.

This is the first fascicle of the special part of Prof. Marquez's textbook on Clinical Ophthalmology, and third of the series he has been publishing. This fascicle includes in its first chapter or "lecture": diseases of the ciliary region, of the lids, palpebral aperture, operations performed on the lids, and blepharoplasty.

In the second chapter are described diseases of the orbita and the semeiology of exophthalmos; in the third, the anatomy and physiology of the oculomotor apparatus and muscle operations; and in the last two chapters, the author deals with lacrimal diseases and their treatment, especially by operations.

The book is very well printed and profusely illustrated and conveys to the reader a great deal of modern and complete information. It is more an encyclopedia than a textbook.

In the chapter on "Disorders of the motility of the eyes," very little credit is given to American authors. Professor Marquez quotes only Peter's work, but mentions at length opinions of English and German authors.

The chapter on "Paralysis of the external muscles" is very well written and shows graphically the function of the muscles and the place of both images

in diplopia. For the diagnosis of the paralyzed muscle the author uses only subjective tests for diplopia; he does not mention the objective or screen test, so much used in this country.

In the chapter on "Operative correction of strabismus," he describes a case of tenotomy of the inferior rectus which he performed with success.

The second and last part of this book will include diseases of the eyeball, ophthalmic neurology, and the relations of ophthalmology and general medicine.

Manuel Uribe-Troncoso

OBITUARY

Claud A. Worth

The death of Claud A. Worth occurred on June 21st at Falmouth, on the south coast of Cornwall, England. He was born and grew up at Holbeach, near the coast of Lincolnshire. He studied medicine at St. Bartholomew's Hospital, London, qualified in 1893, and then studied in Paris. He became a Fellow of the Royal College of Surgeons of England in 1898. He served as Ophthalmic House Surgeon in the Loughborough Hospital near Birmingham, and there showed his understanding and love for children.

In 1898 he returned to London and became head assistant at the Royal London Ophthalmic Hospital. In 1899 he became a member of the Ophthalmological Society of the United Kingdom. Before its meetings he presented most of his important observations. The first of these papers was read on October 18, 1900. Its subject was "Orthoptic treatment of convergent squint in young children." In this paper he described the form of reflecting stereoscope which he called an amblyoscope. It was designed especially to secure simultaneous vision with both eyes. It was modified by others and became the progenitor of several of the widely used instruments of today.

In 1902 appeared Worth's book on "Squint, its causes, pathology and treatment." He emphasized the importance of training the "fusion faculty," which,

he believed, reached full development by the seventh year. Fully to "cure" a case of squint—develop full binocular vision—training must begin as soon as squint is noticed; much earlier than had previously been attempted. This book ran through six editions and was translated into several other languages.

In a paper on "The heredity of myopia," Worth told of a family, followed through several generations, in which the males were myopic, but the mothers who transmitted the defect were not. He also described two cases of congenital cystic change in the posterior layer of the iris. A case of this kind has been seen by the writer, but no other mention of the condition has been found in the literature.

Worth also published a book on "Yacht cruising," which has been spoken of "as a classic by yachtsmen who were unaware that he had had other interests in life." "It was a source of great regret to Worth to be obliged, because of ill-health, to give up his ocean-going craft; but to the end he kept a small yacht for coastal cruising." On account of his broken health he gave up practice, removed from London in 1921; and resided in Falmouth. The harbor there is the first refuge for craft that have passed Lands End and the Lizard, escaping from the storm-driven Atlantic.

In America, ophthalmology owes much to Worth, although the muscle advancement operation he devised and improved has been modified and simplified by others. His retirement for fifteen years from active practice has caused him to be less known than he should be to the younger ophthalmologists.

Edward Jackson.

CORRESPONDENCE

The International College of Surgeons
Sept. 10, 1936

Editor,
American Journal of Ophthalmology.

The establishment of Colleges of Surgeons in the principal countries of the world has resulted in a higher standardization of surgery. Not only has it stim-

ulated surgeons to strive for a higher goal, particularly the younger man, but it has also raised the standards of hospitals until it has eliminated a horror against hospitals which was universal for so many years.

It is timely that an International College of Surgeons be formed. The International Surgical Society has been in existence for some years. It is a highly respected organization, limited in membership and, under the able leadership of Dr. Mayer, of Holland, has done good work. But it has made no attempt to broaden its field. The International College of Surgeons, however, with headquarters in Geneva, Switzerland, will open its doors to all reputable surgeons, of all countries, who can pass the severe examination or who, because of outstanding ability, are recognized as of sufficient eminence to be appointed without examination.

Professor Arnold Jirasek, of Czechoslovakia, was recently appointed President. Professor Albert Jentzer, of Geneva, was appointed Secretary-Treasurer General for Europe. We are happy to state that the appointment of Director-General was tendered to Dr. H. Lyons Hunt, of New York City, who for years held the same position with the American Medical Editors' and Authors' Association.

Naturally everyone is interested in knowing who, of the American Surgeons, have already been chosen for Fellowship. For obvious reasons it would be untimely to mention them here. A

booklet of their names, addresses, and hospital affiliations has already been prepared.

The number of Regents and appointed Fellows throughout the world is limited to one thousand. In the list of American and Canadian surgeons recently sent out, are the names of a few hundred of the most prominent surgeons on this continent. If the same intelligence is used for all honorary appointments, the College will have a nucleus of the greatest men in surgery in the whole world.

The creation of an organization of this kind was bound to meet with a certain amount of criticism. We are not unmindful that the American College of Surgeons had to combat such criticism in its formative years. The answer—the acceptance of Fellowship by the outstanding surgeons of this country and Canada. The College must stand or fall by showing its need, by having on its roster those men in surgery who have always had the highest ideals and who have the courage and leadership ability to make a success of any undertaking to which they have lent their names. Naturally, the administration of such an organization must be placed in the capable hands of men who have vision, who are unbiased and who will work with an idealism which will make the College respected. We feel that a right start has been made. The future will tell the rest of the story.

Harold Hays, M.D.

133 E. 58th St., New York City.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, history
19. Anatomy, embryology, and comparative ophthalmology

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Groenouw. Sympathetic ophthalmia resulting from gonorrheal corneal ulcer, observed for nineteen years. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 742.

The right eye of a man of 43 years became affected with sympathetic ophthalmia two months after perforation of a gonorrheal ulcer of the left cornea. After enucleation of the left eye the sympathetic ophthalmia healed well, but it repeatedly relapsed for nineteen years, with final recovery and normal vision after correction. The choroid showed small white peripheral foci which subsided completely. Examination of the blood revealed decrease of polynuclear leucocytes and increase of mononuclear cells, especially lymphocytes. By some authors this is considered characteristic of sympathetic ophthalmia.

C. Zimmermann.

Melanowski, W. H. Contribution to the pathogenesis of sympathetic ophthalmia. A case of sympathetic ophthalmia due to intraocular melanoma. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 52.

A girl of twelve years affected with melanoma of the choroid of the left

eye developed sympathetic ophthalmia of the other eye. The left eye was enucleated after several months, and under treatment with injections of malarial blood and neosalvarsan the right eye recovered. After five years it had normal vision. As the number of cases of sympathetic ophthalmia with intraocular melanoma is very small, another etiologic factor seems necessary. This factor may be tuberculosis. The patient was delicate and had a brother with pulmonary tuberculosis. (Illustrations.)

C. Zimmermann.

O'Brien, C. S. Tuberculosis of the uveal tract. *Trans. Pacific Coast Oto-Ophth. Soc.*, 1935, 23rd annual meeting, pp. 67-77.

This is a general review of the subject. Probably the safest and most accurate diagnostic method is Mantoux's intradermal injection. The dose used in treatment should not be so small that antibody formation is not stimulated or that no reaction is generated in the lesion. Treatment should begin with a dose much smaller than that which produced a diagnostic local reaction.

W. H. Crisp.

Tooke, F. T. Tuberculosis of the choroid associated with generalized miliary tuberculosis. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, p. 201. (See

Amer. Jour. Ophth., 1936, v. 19, April, p. 358.)

8

GLAUCOMA AND OCULAR TENSION

Hosford, G. Cortin in glaucoma. California and Western Med., 1935, v. 43, Oct., p. 254.

In a 35-year-old female, tension dropped from 60 to 45 mm. of mercury after intravenous injection of 1 c.c. of cortin. She was thus tided over the acute stage until surgery could be done.

Theodore M. Shapira.

Palmieri, Carlo. The effect of intravenous injection of hypertonic solution of sodium chloride on intraocular tension. Ann. di Ottal., 1936, v. 64, April, p. 217.

The author reviews our present knowledge of physiologic chemistry; of the genesis, flow, and physiochemical properties of the ocular fluids and of the blood; and of the elasticity of the enveloping tissues of the eyeball. He discusses the idea, first advanced by Cantonnet, that osmosis in glaucoma might be increased by hypertonic intravenous injections. We must distinguish between colloidal suspensions and true solution in which there is actual molecular and ionic dispersion. Experiments were made on a number of glaucomatous patients under carefully noted conditions. In every instance, in varying forms of glaucoma, there followed a diminution of tension, differing in degree, rapidity, and duration. The effects lasted from six to eighteen hours. Neither polydipsia nor polyuria followed the injections. The author considers the ocular hypotension obtained as due to the increased colloido-osmosis of the blood. Even a temporary reduction of tension may be a great aid before operative intervention. (Bibliography.)

Park Lewis.

Weekers, L., and Fanchamps, J. Contribution to the clinical study of consensual ophthalmotonic reactions. Arch. d'Ophth., 1936, v. 53, July, p. 513.

Various experimenters, by contusing or cauterizing or otherwise injuring an

eye, have produced an ophthalmotonic reaction in the other eye. Clinical experience supports this finding. The authors report two such cases, one of hypermature intumescent cataract with acute glaucoma in the right eye. The intraocular tension fell in both eyes following pilocarpin instillations in the affected eye. Case two was one of glaucoma secondary to iritis in one eye. The tension fell synchronously in both eyes following treatment to the affected eye. The authors explain this action as due to a vasomotor tie-up between the two eyes by way of the nervous system; and they point out that other paired organs (arms, kidneys) have shown similar vasomotor reactions. (References.)

Derrick Vail.

9

CRYSTALLINE LENS

Aliquo-Mazzei, A. Cataract from dysfunction of the internal secretory glands. Lettura Oft., 1936, v. 13, April, p. 123.

Observations are presented in three cases of myotonic dystrophy and in two of pituitary disease. The pituitary cases were submitted to X-ray studies of the skull. Endocrine dysfunction is said to be present in juvenile and presenile cataract more commonly than is generally believed. One or another gland may be the chief influence in a given case but in general a polyglandular syndrome exists in which the pituitary plays an appreciable part. (Extensive bibliography.)

F. M. Crage.

Arruga, H. The advantages and inconveniences of total extraction of cataract. Bull. Soc. Franç. d'Ophth. 1935, v. 48, pp. 218-222.

The advantages of intracapsular extraction are freedom from after cataract, absence of local reaction, rapid restoration of vision, and the possibility of extracting immature lenses. The disadvantages are more difficult technique, loss of vitreous, incarceration of iris. The method is not applicable to congenital, traumatic, intumescent, or hypermature lenses. Hyphema is more frequent after intracapsular extraction.

The advantages outweigh the disadvantages.

P. J. Leinfelder.

Brown, E. V. L., and Evans, E. I. Studies on the crystalline lens. The nature of the reducing substances in the lens. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 220-236.

This highly technical paper does not lend itself to abstract. It discusses the presence or absence of cystin or cysteine in the crystalline lens, the sulphhydryl substance in the lens, the autocatalytic growth of cattle lens, the progressive amount of glutathione in the lens, the ascorbic acid content, and the chemical changes following administration of naphthalene in dogs and rabbits.

David O. Harrington.

Burky, E. L., and Henton, H. C. Staphylococcus toxin combined with lens extract as a desensitizing agent in individuals with a cutaneous sensitivity to lens extract. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 782-785.

Clark, J. H. The effect of ultraviolet radiation on lens protein in the presence of salts and the relation of radiation to industrial and senile cataracts. *Amer. Jour. of Physiology*, 1935, v. 113, Nov., p. 538.

Experiments show that the higher incidence of cataract in workers exposed to molten glass and metals is due to increased rate of precipitation of light-denatured protein when the lens is heated above body temperature by exposure to large sources of radiant heat, and when low concentrations of calcium or other substances producing similar effect are present.

Theodore M. Shapira.

Hildreth, H. R. The fluorescent lamp for cataract surgery. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 770-773.

Horváth, Béla. Cataract operation with subsequent extraction of the capsule. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 746.

A large incision with Rosa's discission needle is made into the capsule near its equator and after removal of

the lens the capsule is grasped and extracted with the author's specially constructed forceps, while the central edge of the corneal wound is being lifted with forceps. The single steps of the operation are described in detail with illustrations.

C. Zimmermann.

Jeandelize, Baudot, and Gault. Aphakia and detachment of the retina. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 305-316. (See Section 10, Retina and vitreous.)

Kalt, E. Intracapsular extraction of senile cataract with forceps. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 243-246.

Kalt obtains intracapsular extractions in sixty percent of his cases. He believes sutures are needed for closure of the wound.

P. J. Leinfelder.

Nesi, Vicente. A new model of erisiphake. *Rev. de Ophth. de São Paulo*, 1936, v. 4, May, pp. 243-246.

The apparatus is illustrated and briefly described.

Puiggari, M. I., and Adrogué, E. 2,330 cataract operations performed with the forceps (total extraction). *La Semana Med.*, 1936, v. 43, April 9, pp. 1117-1129.

Detailed description of the intracapsular operation is given. The Arruga forceps is preferred. The authors feel that the intracapsular technique should be attempted in almost all cases of cataract operation, even in cases of juvenile cataract, with or without heterochromia, and in varieties of traumatic cataract in which the capsule is easily torn.

W. H. Crisp.

Raverdino, Emilio. Forceps extraction of traumatic cataract. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 215-217.

The author discusses the value and technique of intracapsular extraction of traumatic cataract.

P. J. Leinfelder.

Roche, C., and Roux, A. The myth of the mature cataract. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 207-214.

The author discourages the practice

of allowing cataracts to become ripe before operating. He believes it impossible to tell when a cataract is completely opaque, and even though it appears mature the extraction is not more simple than for an immature lens. Residual cortex is rapidly absorbed. Sclerosed lenses may never become completely opaque, and the patient is forced to endure poor vision for many years.

P. J. Leinfelder.

Sourdille, Gilbert. Extraction of the lens in its capsule. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 233-242.

Since 1930 the author has done 527 cataract extractions, of which 472 were intracapsular. He reviews the results and explains his technique, which follows Elschnig's principles. He uses a large incision (more than two-fifths of the cornea) preserves the round pupil when possible, grasps the lens below, and delivers it by tumbling. Stitches are used to close the wound. The complications differ little from those of the extracapsular method. Hyphema is not infrequent, but is believed to be due to trauma by the patient.

P. J. Leinfelder.

Sourdille, G. P. Statistics on intracapsular extractions. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 223-233.

The results and complications, operative and postoperative, are given for 239 cataract extractions of which 182 were intracapsular and 57 extracapsular.

P. J. Leinfelder.

Terson, A. Location and technique of optical iridectomy in zonular cataract. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 199-206.

In patients with zonular cataract vision can frequently be improved by means of mydriasis and stenopeic glasses, as often there is greater visual acuity in one area of the lens than in others. The author does optical iridectomy and finds the position of choice is usually upward or in the superior nasal quadrant. He has devised a shell which fits over the cornea, but leaves a slit opening to represent the iridectomy. By rotating this appliance the best

point for operation is localized. A complete but narrow iridectomy is usually best. (Illustrations.)

P. J. Leinfelder.

Trematore, M. Xeroderma pigmentosum and cataract. *Lettura Oft.*, 1936, March, p. 103.

Mention is made of reports in the literature of cataract associated with special dermatoses. Only one other case of xeroderma pigmentosum with cataract could be found among them. The author reports a case of xeroderma pigmentosum with bilateral posterior cortical cataract in a female aged eighteen years. The skin condition began on the right side of the face. With proper protection to the eyes this side only was treated with X ray several times (1926). Progressive diminution in vision has occurred in both eyes in the past two years. Under the slitlamp both lenses showed opacities in the posterior layers of the cortex. The author advances the hypothesis that these bilateral posterior cortical cataracts may be caused by the same factors which produce the xeroderma pigmentosum. (Bibliography.)

F. M. Crage.

Von Bahr, Gunnar. Studies on the etiology and pathogenesis of zonular cataract. *Acta Ophth.*, Supplement 11, 1936, v. 14.

A very exhaustive review of the literature is followed by detailed report of experimental studies on rats, which were placed on a rachitogenic diet, and examined for the effect of this diet and its modifications on the development of lenticular opacities, tetany, and hypoplasia of dental enamel. Uncomplicated rickets did not produce lenticular opacities; but in rickets complicated with sufficiently advanced tetany lenticular opacities in the superficial cortical layers occurred regularly. These opacities continued to develop after recovery from tetany, with subsequent formation of a zonular cataract, clear fibers enclosing the opaque portion of the lens. In these experiments tetany occurred in response to a high phosphorus increase in the rachitogenic diet. Malformations in the dental enamel could

not so clearly be attributed to tetany, although they were found more frequently in rachitic rats with tetany than in uncomplicated rickets. The lenticular changes appeared partly as vacuoles containing an opaque substance between the lens fibers, and partly as radial lines and very marked ground glass zones of discontinuity. The author concludes that human zonular cataract is due to infantile tetany which usually depends on rickets, and thus indirectly on a nutritional deficiency. The author's experimental data do not support the belief that maternal tetany during pregnancy may cause zonular cataract in the offspring. They suggest that hypocalcemia is an essential factor in formation of cataract. (Illustrations.) Ray K. Daily.

Vormann. Contribution to A. Vogt's late contusion rosette. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 819. (See Section 16, Injuries.)

Walker, C. E., Jr. A modified capsule forceps for cataract extraction. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 794-795.

Yudkin, A. M., and Arnold, C. H. Cataracts produced in albino rats on a ration containing a high proportion of lactose or galactose. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 281-290. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 362.)

10

RETINA AND VITREOUS

Alajmo, B. Coats's retinitis. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 405-416.

A man of 36 years, with negative family and personal history, showed marked conjunctival and periconal injection of the right eye. The vision was totally abolished, the anterior chamber deeper than the left one, the iris entirely adherent to the lens capsule, and the tension increased. The retina was separated especially in the nasal and temporal sectors. Histologic examination of the enucleated eye showed an abnormal substance between retina and

choroid. This, according to the author, was a fluid of choroidal origin very rich in albumen and other material derived from necrosis of the pigment epithelium. The changes in retina and retinal blood vessels are to be considered as a result of trophic, mechanical, and toxic changes in the choroid. The etiology of the disease remains obscure. (11 figures.) M. Lombardo.

Allen, J. H., and Howard, W. A. Lipemia retinalis. *Amer. Jour. Ophth.*, 1936, v. 19, Aug., pp. 645-648.

Ankell, Gonzalez. From Poulard to Gonin, retinal detachment. *Rev. de Ophth. de São Paulo*, 1936, v. 4, May, pp. 247-276.

This thirty-page article (in Spanish) in a Portuguese language journal is devoted chiefly to detailed description of the Gonin operation, with preliminary localization, and a discussion of complications. W. H. Crisp.

Arruga, H. Prognosis in treatment of retinal detachment. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 348-355.

In general detachments are less amenable the longer they have existed. Young patients form scars more readily and offer a better prognosis, and those in good general health are more successfully treated. Cases caused by severe traumatism have a very bad prognosis. Ora serrata tears are usually placed inferiorly, and yield quickly to treatment. Superior detachments are more serious than inferior, and temporal ones cause greater destruction of vision than nasal ones. Multiple tears, aphakia, degenerative lesions of the retina, and hyperemia of the eye increase the seriousness.

P. J. Leinfelder.

Brenta, J. A case of external exudative retinitis (Coats). *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 164.

Busacca, A. Withdrawal of cerebrospinal fluid in cases of hypertensive retinitis. (Italian paper in polyglot Brazilian journal.) *Folia Clin. et Biol.*, 1936, v. 8, no. 2, pp. 41-47.

In 1932 and 1933 Magitot and Du-bois, in two successive communications, reported a number of cases in which symptoms of retinitis regarded as hypertensive had receded or had even been cured with appreciable recovery of visual function, after withdrawal of cerebrospinal fluid. Busacca has applied this method to two cases which he now reports. In the former, one of hypertensive retinitis with diabetes and albuminuria and with hypertension of the cerebrospinal fluid, withdrawal of that fluid, undertaken when the ocular disturbance was in an advanced stage of development, produced slight transitory improvement of the ocular symptoms but did not prevent their further progress. In a case of retinitis from essential hypertension, with compensated diabetes and hypertension of the fluid, withdrawal of the fluid, started a little while after onset of the ocular disturbance, produced rapid absorption of the retinal exudates and hemorrhages with improvement of visual function. Busacca raises a number of questions with regard to the principle involved, and says that the validity of the procedure can only be determined after a great many trials.

W. H. Crisp.

Danis, M. The retinal complications of nephritis. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 26.

This comprehensive study includes a brief history of the subject, a consideration of the retinal lesions, and finally of pathogenesis. From statistical study of 49 cases treated at the University of Brussels, the following conclusions are reached: When nephritis is complicated by retinitis the mortality increases considerably. Retinitis occurs in chronic glomerulo-nephritis, in renal sclerosis, in infectious glomerulo-nephritis, and in malignant hypertension; not in lipid nephrosis or in hemorrhagic nephritis. The general arterial tension is always increased in nephritis accompanied by retinitis. Albuminuric retinitis is always accompanied by arterial hypertension. Azotemia is very frequent but not constant. In the present state of our knowledge the mechanical

vascular theory appears the most probable.

Jerome B. Thomas.

Fralick, F. B., and Pect, M. M. The hypertensive fundus oculi after resection of the splanchnic sympathetics. *Trans. Amer. Acad. Ophth., and Otolaryng.*, 1935, 40th annual meeting, p. 119. (See *Amer. Jour. Ophth.*, 1936, v. 19, Sept., p. 815.)

Franceschetti, A., and Roulet, E. Syndrome of Groenblad and Strandberg (angioid streaks of the retina and pseudoxanthoma elastica) and its relation to mesenchymal affections. *Arch. d'Ophth.*, 1936, v. 53, June, p. 401.

Since Groenblad and Strandberg were the first to demonstrate the relation between angioid streaks and pseudoxanthoma elastica, the disease should be known as their syndrome. Two fairly typical cases are described and illustrated. After exhaustive review of the literature, the various theories as to the cause of the fundus picture are discussed. The authors incline toward the theory of Kofler and Groenblad, that a rupture of the lamina vitrea is responsible. There is also a close relationship between macular hemorrhage and senile pseudotumor of the macula, both of which may be considered as alterations of the elastic tissue and of blood vessels. The hereditary features, as analyzed from the literature, are believed to be of the recessive type. (Illustration, bibliography.)

Derrick Vail.

Fritz. Alterations of the retinal circulation in changes of position of the body. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 264.

In a former paper the author had sought to prove that perfusion of blood at the level of the retina was maintained physiologically at an optimum quantity by an adaptation of the blood pressure to the caliber and elasticity of the vessels. This would seem to offer evidence of analogous conditions of the cerebral circulation. These ideas suggested study of the behavior of the retinal circulation in the course of changes in bodily position. If one meas-

ures simultaneously the brachial and retinal blood pressures it is found in a certain number of cases that there is no change in either pressure during changes of position of the body. This proves that above the mechanism for cardiac regulation there exists a mechanism for local vascular regulation. An important variability (0 to 25 mm. of mercury) was found to obtain among different individuals in regard to the regulation which the organism is prepared to oppose to hydrodynamic changes resulting from changes of position of the head with reference to the heart. These qualities are of great practical importance in aviators, who by the nature of their profession are subjected to sudden and violent changes of position in space, and in whom regulation of the cerebral and retinal pressure is of paramount importance.

Jerome B. Thomas.

Fritz. Contribution to the physiopathology of retinitis. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 280-287. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 363.)

Fritz. Dichrotic pseudopulse of the retinal vein. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 259.

Alternating venous pulse arises from adhesion between the arterial and venous walls, and is manifested by diastole at the moment of arterial systole. Exceptionally the normal venous pulse and the alternating venous pulse just described may overlap so as to give rise to a dichrotic venous pulse forming a transition between the primary and the alternating venous pulse.

J. B. Thomas.

Govaerts, Paul. Classification of nephropathies based upon renal physiopathology. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 15.

This 35-page paper discusses the subject exhaustively. When nephritis is complicated by retinitis the prospect of death is considerably increased. Retinitis is encountered in chronic glomerulonephritis, in renal sclerosis, in infectious glomerulonephritis, and in

malignant hypertension. It is not found in lipoidal nephrosis or in hemorrhagic nephritis. The general arterial tension is always increased in cases of nephritis with retinitis.

J. B. Thomas.

Granit, Ragnar. The electrophysiology of the retina and optic nerve. *Acta Ophth.*, Supplement 8, 1936, v. 14.

The action potential of the retina or the electroretinogram was discovered by Holmgren in 1865. The use of vacuum amplifiers, attached to a string galvanometer, permitted Chaffee, Bovie, and Hampson to study the electroretinogram in detail. Hautline in 1925 demonstrated that the electroretinogram of the excised eye is identical with the electroretinogram of living animals, and he also registered the human electroretinogram in 1931. The author and his co-workers studied the human electroretinogram with the amplifiers and the string galvanometer, and they made numerous studies of the electroretinogram of doves, eels, rabbits, and cats. These studies show that the electroretinogram is a complex curve of three components of various time relations and electrical signs: state of adaptation, intensity of stimulus, and size of stimulated area. A study of the relation of the components of the electroretinogram to the impulses of the optic nerve shows that the retina generates excitatory and inhibitory impulses, which can be differentiated on the electroretinogram. In 1855 Schafhautil used intermittent light for the study of the visual processes. When rapidity of stimulation reaches a certain frequency the light is perceived as a continuous stimulus, and the number of stimulations per second required to achieve this effect is known as the fusion frequency. The fusion frequency and the electroretinogram can be used as a quantitative and objective measure of the visual retinal processes. An exhaustive study of the electroretinogram of intermittent stimulation leads the author to believe that the electrical reaction points to the presence of two types of retinal elements. The positive wave corresponds to the excitation element associated with an increase of im-

pulses in the optic nerve, and the negative wave represents the inhibitory element associated with inhibition of impulses in the optic nerve. The retina of the dove is of the inhibitory type, that of the cat of the excitation type. In the other animals the retina was found to possess a mixture of both elements. The rods predominate in the excitation type of retina, while the cones are linked with the inhibition elements. The human retina is centrally of the inhibition type and peripherally of the excitation type. The excitation elements are most active in dark adaptation and have a low fusion frequency. The inhibitory system has a high fusion frequency and is most responsive in light adaptation and to intense stimuli. In diseased conditions the fusion frequency is lowered and the electroretinogram shows that the inhibitory elements are more resistant than the excitation elements, and that each system may be selectively involved. This method of examination may thus serve in the differential diagnosis of retinal diseases. Such studies in glaucoma demonstrate that the excitation elements are the first to be attacked. The author believes that this method of studying retinal function will yield more precise information than that obtained by photometric methods.

Ray K. Daily.

Greeves, R. A., Marshall, J. C., Adams, P. H., Butler, T. H., and others. **Analysis and results of cases operated upon for retinal detachment.** Trans. Ophth. Soc. United Kingdom, 1935, v. 55, pp. 392-407.

Greeves reports on seventy consecutive cases of detached retina which were operated upon by the non-perforating diathermy method. The blunt electrode was used, and the subretinal fluid evacuated by trephining down to the choroid and puncturing the choroid with a lacrimal dilator. The final results were 36 cures out of the seventy cases operated upon. In the cured cases were included only those in which no residual detachment was visible.

With the use of Gonin's thermocautery puncture, and the diathermy

micropuncture method as advocated by Safar, Marshall operated upon 74 cases with 34 cures, and 16 improved. The worst failures were in the cases operated upon two or three times.

The author concludes that the future of detachment operations will be greatly influenced by the way the surgeon watches the progress of the case with the ophthalmoscope during the operation. Surface coagulation together with micropunctures to let out fluid will probably be found the best method of operating.

Twelve cases including fourteen eyes were operated upon by Adams, all with good results; in seven eyes with no detachment visible and vision improved to between 6/18 to 6/9.

Butler reports 21 operations. In twelve, holes or tears were found. In six, the detachment was cured, and in six the vision was improved or restored to normal. Of six cases with holes operated upon by Gonin's method, three were successful and three failures. In the cases without holes only about twenty percent were successful and diathermy was far more successful than the Gonin method.

Beulah Cushman.

Heine, L. **Amotio retinae.** Deut. med. Woch., 1936, no. 25, June 19, p. 1008.

In this article Heine discusses the various etiologic factors concerned in producing retinal detachment. In order of importance he discusses trauma, myopia, iridocyclitis, chorioretinitis, and tumors. He states that with Uthoff he reviewed the whole subject of retinal detachment thirty years ago and that since then only the methods of examination and treatment have been improved, the underlying principles being still the same.

Theodore M. Shapira.

Jensen, V. A. **Clinical studies of tributary thrombosis in the central retinal vein.** Acta Ophth., Supplement 10, 1936, v. 14.

Detailed reports of 61 cases of thrombosis of a branch of the central retinal vein in 54 patients. In 56 percent of the patients the obstruction was in the up-

per temporal and in 36 percent in the lower temporal vein. Seventeen subsequently presented a picture of retinitis circinata, and in sixteen there were secondary central changes. Thrombosis from a branch, unlike thrombosis of the central vein, has no tendency to cause glaucoma. The thrombosed retinal region may be the seat of recurrent hemorrhages which give rise to opacities and retinitis proliferans. The duration of life subsequent to occurrence of thrombosis is variable, and the disorder is of no prognostic significance relative to life.

Ray K. Daily.

Kraupa, Ernst. Central retinochoroiditis of congenital syphilis. *Zeit. f. Augenh.*, 1936, v. 89, June, p. 204.

Central retinochoroiditis in congenital syphilis was not commonly observed even before syphilis had decreased in frequency. Kraupa saw only two characteristic cases in 22 years. The first, seen in 1914, was in a fifteen-year old infantile female with Hutchinson teeth. In the right eye there was a central densely pigmented chorioretinal lesion and peripherally a pepper and salt retina. The other patient (1920), a thirty-year old woman, with signs typical for congenital syphilis, had a large chorioretinal lesion in each macula, eight discs wide in the right and four in the left. Peripherally the fundus had a coarse pigment disturbance. In the center of the lesion of the right eye was a yellowish, sharply defined spot smaller than the papilla. In very intense light it seemed to be a cryptic cavity. In neither patient was the appearance and location of the lesion such as to distinguish it from a retinochoroidal lesion from other cause.

Kraupa surmises that his lesions are the end result of a gummatous process, although Rönne thinks lesions of this type develop at the same period with typical excavated coloboma of the macula.

F. Herbert Haessler.

Kyrieleis, Werner. Eyeground changes in lymphogranulomatosis. *Zeit. f. Augenh.*, 1936, v. 89, June, p. 193.

Hodgkin's or Sternberg's disease

simulates leukemia in that swellings of the lymph nodes and spleen occur, but without the characteristic blood picture of leukemia. The lymph nodes of the orbit and lids, and also the lacrimal gland, are occasionally involved. Kyrieleis's patient had been observed for six years but his eyes were examined for the first time six days before death. The optic papillae were normal, the arteries dilated to the diameter of an average vein, and all the vessels very tortuous. Near the papillae were many fiber-layer hemorrhages, and in each eye was a large preretinal hemorrhage. Lids and conjunctiva were normal and there was no exophthalmos. Histologically, no lymphogranulomatous changes were found in the eyeball. The secondary anemia had produced the retinopathy.

F. Herbert Haessler.

Mamola, P., and Bellina, G. New ideas of the pathogenesis and treatment of retinitis pigmentosa. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Nov.-Dec., p. 699.

The authors present a review of the most important theories. The frequent accompaniment of mental disturbances with the condition suggests a mesencephalic syndrome. Careful investigation of such cases often reveals disturbance of the hypophysis, further supported by the fact that administration of ovarian hormone benefits the eye condition. Eight cases of pigmentary degeneration were studied by X rays of the skull, water metabolism and carbohydrate tolerance. The authors conclude that there is actually a disturbance of function of the hypophysis. Their patients were apparently bettered by intramuscular administration of anterior pituitary extract. (13 figures.)

Eugene M. Blake.

Mecca, Mario. Retinitis pigmentosa, clinical and experimental contribution on its etiology and therapy. *Ann. di Ottal.*, 1936, v. 64, March, p. 172, and April, p. 252.

The author makes a very complete study of the present status of this disease. The pathogenic mechanism involves two factors, one local and one general, a vascular and a neuro-endo-

crine lesion. That spasm of the retinal vessels is present is substantiated clinically by therapeutic results obtained with vasodilator drugs. The author has found in every patient evidence of endocrine imbalance. He concludes that disturbed vascular equilibrium is basic in the affection. As concerns the therapeutic value of acecolin the results obtained by Corrado are fully substantiated. Injection of adrenalin into the vitreous of rabbits produced an ophthalmoscopic picture in accord with that presented in pigmentary degeneration of the retina. Detailed reports on a number of patients are given. The literature is carefully reviewed and the conclusions of previous authors are summarized. (Bibliography, 4 plates.)

Park Lewis.

Musabeili, I. Retinal hemorrhages in malaria. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 5, p. 726.

By review of the literature and report of seven cases, the author shows that malarial involvement of the posterior ocular segment is usually in the form of hemorrhagic retinitis. This is most frequently seen in tropical malaria, is absorbed under treatment, and has a favorable prognosis. In acute attacks it is probably caused by hyalin thrombosis, parasitic embolus, or toxic changes in the vessel walls. In chronic malaria the hemorrhages are probably caused by a change in the composition of the blood and blood vessels resulting from secondary anemia.

Ray K. Daily.

Pischel, D. K. An unusual case of bilateral retinal detachment. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 795-796.

Sanctis, G. E. de. The visual fields in retinal detachment after surgical treatment. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Sept.-Oct., p. 589.

De Sanctis carefully describes the condition of the eyes before and after surgical treatment in five cases of retinal detachment, one bilateral. The fields for white, blue, red and green are reproduced. Fields were first taken in

good daylight and then in the dusk, but no quantitative measurements of light were made. Operation was performed in from a few days to four months after detachment appeared. The time element did not affect the findings materially. After surgical reattachment there remains a functional defect—limitation of field—in the sector corresponding to the detached retina. The field defect is considerably larger when the examination is made under reduced light, a fact which the author considers valuable in examination. (One figure.)

Eugene M. Blake.

Strampelli, B. The diathermic diaphanoscope in the treatment of retinal detachment. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 370-372. (See *Amer. Jour. Ophth.*, 1936, v. 19, Feb., p. 185.)

Streiff, J. A superficial scleral flap to facilitate Gonin's operation and withdrawal of vitreous. *Zeit. f. Augenh.*, 1936, v. 89, June, p. 197.

Because the sclera is so resistant, the pressure necessary to introduce a needle large enough to draw off abnormal vitreous is dangerous to the eyeball. Streiff has excogitated a procedure for making a trapdoor-like flap, to facilitate puncture of the inner coats of the eyeball. He also finds this flap helpful in performing Gonin's operation for retinal detachment.

F. Herbert Haessler.

Van Bogaert, L. Ophthalmologic interest in the group of dyslipidoses. *Bull. Soc. Belge d'Opht.*, 1935, no. 71, p. 154.

Pigmentary degeneration of the retina in persons mentally sound may give rise in their descendants to severe cases of amaurotic idiocy which completely lack the visual troubles and changes in the eyegrounds. Amaurotic idiocy is only one of the forms of the dyslipid group of which the others are just beginning to be defined. If phosphatid lipidosis has such a marked predilection for brain and retina, is the same true of the other morbid types of this great group? Recent collaboration of ophthalmologists and neurologists raises this important question: Do the pro-

gressive and familial macular degenerations, certain forms of hereditary deafness, the diseases of Gaucher, Niemann-Pick, amaurotic idiocy, and certain types of atypical retinitis pigmentosa constitute a single pathologic group which rests on a primary deviation of the lipid metabolism? (Bibliography of 21 references.)

Jerome B. Thomas.

Veil, P., and Dollfus, M.-A. Comparative value of different techniques of obliteration of retinal tears. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 380-385. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 365.)

Weekers, L. Some considerations on the operative treatment of retinal detachment. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 326-343. (See *Amer. Jour. Ophth.*, 1936, v. 19, Jan., p. 72.)

Weekers, L. Operative cure of retinal detachment complicating tuberculous uveitis. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 141.

Minute perforations were made with a knife through conjunctiva and the ocular coats, and a weak diathermic current was then passed through the knife to produce hemostasis.

J. B. Thomas.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Alpers, B., and Yaskin, J. Choked disc in syphilis. *Amer. Jour. Med. Sciences*, 1935, v. 190, Sept., p. 333.

The authors present five cases of choked disc in lues of the central nervous system, four of which responded well to antiluetic treatment. The fifth patient was operated on with good result. The authors conclude that the underlying lesion is probably a basilar meningitis. Theodore M. Shapira.

Denti, A. V. Solitary tubercle of the papilla. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Nov.-Dec., p. 819.

Denti considers the various disease conditions which may localize in the

optic-nerve head and describes their symptomatology. A solitary tubercle at this site occurred in the left eye of a male aged 33 years. There was a strong family history of tuberculosis. The growth involved the periphery of the papilla, was grayish in color, showed no new-formed vessels or pigment deposits. It displaced the vessels on the nerve head. The outcome of the case is not related. (One figure.)

Eugene M. Blake.

Jensen, C. D. F. Hyaline bodies (Drusen). *Trans. Pacific Coast Oto-Ophth. Soc.*, 1935, 23rd annual meeting, p. 59. (See *Amer. Jour. Ophth.*, 1936, v. 19, Jan., p. 74.)

Lauber, H. Concerning the influence of low blood pressure upon diseases of the optic nerve. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 429-438. (See *Amer. Jour. Ophth.*, 1935, v. 18, Dec., p. 1176.)

Pickard, Ransom. The clinical course of cavernous atrophy and its relation to the normal enlargement of the optic-disc cup. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 599.

The author considers patients in whom the cupping of the optic disc had increased in size from 45 to 50 percent without increased tension, and the usual effect of this on the visual fields and light threshold and the tensions found. Cavernous atrophy simulates chronic glaucoma, in which it also happens as an early symptom, and its occurrence suggests an affection of the optic nerve head in which the various tissues are affected in varying degree. The author concludes that the condition does not tend to lead to blindness. Even in severe cases the deterioration of central vision and fields is usually very slow.

Beulah Cushman.

Rubino, Alfio. An atypical case of medullated nerve fibers. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Sept.-Oct., p. 602.

A ten-year-old girl showed in one eye an unusual picture of myelinated nerve fibers. The patch began a half disc-diameter from the upper border of the

nerve as a small, clear-cut band which gradually enlarged and faded away toward the periphery. It began behind a large vessel which it partially invaginated, the white patch starting to enlarge at the bifurcation of this vessel. The nasal borders were clearly defined, while the temporal side presented the usual frayed-out appearance. The color was whitish but not uniform, and along the course of the vessels it was ivory. The upper edge faded gradually into a reddish-white and finally merged into the red of the fundus. Rubino explains this picture upon the basis of different chronological development of the lamina cribrosa and the nerve sheaths, some of the nerve fibers becoming compressed and cut off from the others and appearing in the retina under the familiar appearance of myelinated fibers. (One figure.) Eugene M. Blake.

Skirball, J., and Thurmon, F. Ocular reactions due to arsphenamine. *Amer. Jour. Syphilis and Neurol.*, 1935, v. 19, April, p. 197.

The authors present twenty cases showing definite toxic reactions due to arsphenamine. On the basis of their work they conclude that all patients receiving this drug should submit to an ocular examination before it is administered. There should be frequent ocular examinations at definite periods during treatment with this drug. No ocular symptom should be minimized during such treatment. If the drug is stopped, symptoms clear up rapidly; if continued, symptoms become worse. The ocular picture encountered is one of neuritis with retinal hemorrhages.

Theodore M. Shapira.

Soriano, F., Malbran, J., and Piccoli, H. R. Toxic amblyopias from pentavalent arsenicals (acetylarsan). *La Semana Med.*, 1936, v. 43, July 16, pp. 159-167.

Two cases are reported. The first patient had double renal lithiasis with infection, and chronic renal insufficiency due to reduction of the renal parenchyma. The second patient had acute toxic nephritis, acute toxic anemia, and amaurosis, as well as perihepatitis, pul-

monary congestion, paraplegia, and polyneuritis. The toxic action of the arsenical was unquestionable. The authors believe that the affinity of the pentavalent arsenicals for the optic nerves may be emphasized by renal and hepatic insufficiency. The disturbances in these two cases are attributed to the toxicity of the drug and not to phenomena of reactivation. Treatment of the complication is ineffectual.

W. H. Crisp.

12

VISUAL TRACTS AND CENTERS

Jeandelize, P. Certain aspects of the relations of the hypophysis and the visual apparatus. *Bull. Soc. Belge d'Ophth.*, 1935, no. 71, p. 49.

This invitation lecture delivered before the Belgian Ophthalmological Society occupies 46 pages and is illustrated by 45 figures. After reviewing the anatomy, the author discusses the influence of the visual apparatus upon hypopyseal function, and concludes that a relation exists between the eyes and the hypophysis concerning the function of the melanophores, and that light acts through the eye to produce pigmentary reactions by means of hormones or to activate the evolution of gonads. The existence of a reflex arc between retina and hypophysis has been demonstrated, passing by way of the supraoptical center of the hypothalamus.

According to modern experiments overactivity of the hypophysis plays the most important part in the genesis of hyperthyroidism. The hypophysis becomes enlarged and enters a stage of hyperactivity when the thyroid is atrophied or insufficient. The author maintains that exophthalmos is independent of hyperthyroidism and may occur under the influence of the hypophysis. It is suggestive that one encounters bitemporal narrowing of the field in cases of Basedow's disease operated on by thyroidectomy.

In migraine, recent studies by Drouet and others have shown that there exists

an almost constant participation of the hypophysis evidenced in elimination of the melano-dilator principle in the urine after each crisis, in temporary bitemporal (and other) narrowing of the visual fields, and in retinal tension generally more elevated on the painful side.

Recent studies lead to the following conclusions by the lecturer in regard to recurrent hemorrhages of the young: (a) confirmation of the existence of hyperthyroidism or hyperpituitarism, or even the absence of both, and in the latter case functional modification of another gland such as the adrenal or ovary; (b) the almost constant existence of the pigment reaction (melanophorotrope) obtained with the patient's urine; (c) when transparent media permit the tests, bitemporal field defects and retinal hypertension; (d) encouraging results of irradiation of the hypophysis associated sometimes with ovarian therapy. Three case histories are reported in support of these views.

As to therapy, the use of the endocrine extracts in cases where hyperpituitarism is secondary has long been successfully practised; but when primary it is necessary to add some direct treatment of the overactive hypophysis. The X-ray is the only effective means of such treatment. It has been used by the author and Drouet for several years in recurrent vitreous hemorrhages and by others in Basedow's disease, migraine, and hypertension. The lecturer warns against insufficient dosage which may merely serve to excite the hypophyseal cells and lead to new hemorrhages.

Jerôme B. Thomas.

Redslob, E. Complete blindness in an infant following vaccination against smallpox. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 126-135.

Total blindness developed rapidly in a child of fourteen months, nine days after vaccination. The fundi showed pallor and spasm of the arteries, the pupils were dilated and fixed. Treatment with "acécoline" resulted in gradual improvement with return to normal vision in three months. The fundi continued to show evidence of arterial spasm.

P. J. Leinfelder.

13

EYEBALL AND ORBIT

Bailliant, P. The ocular pulse. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 294-297.

The eye is perfectly adapted for measurement of pulse waves for it is a natural platysmograph. The changes in tension can be noted or transferred to a kymograph by means of a tonometer. Bailliant has studied the pulse waves by the method of Gomez and Langevin. A gravity plate is utilized; the changes in electric energy resulting from changes of pressure on this plate are transferred to a kymograph. Three curves are presented to illustrate the normal and pathologic tracings.

P. J. Leinfelder.

Braun, Reinhard. Gravitating abscess in the orbit in tuberculous osteomyelitis with new-formed bone in the frontal sinus. *Zeit. f. Augenh.*, 1936, v. 89, July, p. 257.

There was unilateral exophthalmos with displacement of the eyeball down and in. Ten years earlier the lacrimal gland had been extirpated because of an erroneous diagnosis of neoplasm in the gland. During the following years, numerous subperiosteal abscesses developed in the orbit. The cause was tuberculous osteomyelitis in the medial portion of the right frontal sinus with new formation of bone. A tuberculous empyema of the sinus perforated into the orbit. Abscesses between the bone and periosteum of the orbital roof gravitated as far as the upper lid.

F. Herbert Haessler.

Chaldejev, S. I. Conjunctivoplasty by the Gilles method. *Sovietskii Vestnik Opht.*, 1936, v. 8, pt. 6, p. 855.

A case of restoration of the conjunctival sac with a skin graft held in place by a large glass sphere remaining in the orbit for two months. (Illustrations.)

Ray K. Daily.

Gatewood, W., and Settel, N. Osteoma of the frontal sinus. *Arch. of Otolaryng.*, 1935, v. 22, Aug., p. 154.

The authors report a case of osteoma

of the frontal sinus which was removed surgically with uneventful recovery.

Theodore M. Shapira.

Karsch, Johannes. Inherited malformation of eyes associated with cleft hand and foot. *Zeit. f. Augenh.*, 1936, v. 89, July, p. 274.

In routine examination of the blind of Leipzig, a father and 37-year-old daughter were found who had similar eye lesions associated with malformations of hands and feet. Each had pendulum nystagmus, divergence of the right eye, and a retinal lesion which must most probably be classed with the tapetoretinal degenerations. Each had a cataract: the father's did not mature until late in life, but in the daughter a membranous cataract had manifested itself in youth. The father had synostosis of the third and fourth phalanges of one hand and foot, while the daughter had typical crab-claw hands and feet.

F. Herbert Haessler.

Kleefeld, G., and Leroy, F. Importance of a radiologic examination in orbital inflammations of children. *Bull. Soc. Belge d'Opht.*, 1935, no. 71, p. 173.

In the six cases observed by the authors the orbital swelling appeared variously preceding and following other infections, such as mastoiditis in one case, otitis in another. Complete absence of nasal symptoms should not weaken the probable diagnosis of ethmoiditis. These are cases of closed ethmoiditis with a tendency to spread toward the orbit. In every case the radiogram affirmed a diagnosis of ethmoiditis. In all cases in which any sign threatens orbital phlegmon, and without waiting for certain signs of suppuration, one should drain the ethmoid. No attempt at exenteration should be made, but by pushing aside the middle turbinate and entering the ethmoid by puncture or curette one changes a closed to an open ethmoiditis and avoids puncture of the orbit.

Jerome B. Thomas.

Pfingst, A. Pulsating exophthalmos in infancy. *Kentucky Med. Jour.*, 1935, v. 33, July, p. 327.

The author reports a case of pulsating exophthalmos in a twenty-month-old white female whose eye was finally removed. He discusses differential diagnosis and includes orbital neoplasm, nasal sinus disease, Graves's disease, arteriovenous aneurism, and simple aneurism of arteries and veins. Sections of the eye showed plastic iridocyclitis.

Theodore M. Shapira.

14

EYELIDS AND LACRIMAL APPARATUS

Abdulaev, G. G. Surgical treatment of cicatricial trachoma. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 5, p. 712.

A detailed description of the technique of excision of the diseased conjunctiva and tarsus and transplantation of mucous membrane from the lip.

Ray K. Daily.

Abdulaev, G. G. Surgical treatment of the lacrimal passages by Kankrov's method. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 5, p. 710.

After anesthesia of the lacrimal sac, the operation consists of slitting the lower canaliculus, passing Weber's knife through the stricture into the sac, and curettage of the sac. Of seventeen cases fifteen had restoration of function with cessation of epiphora.

Ray K. Daily.

Bakly, M. A. El. Operation for the repair of coloboma of upper lid. *Bull. Ophth. Soc. Egypt*, 1935, v. 28, p. 26.

A case of bilateral coloboma of the upper lid is reported in which repair was made by lining the colobomata with grafts from the mucous membrane of the lips and then utilizing the skin of the lower lid as a covering. The procedure is described in detail.

Edna M. Reynolds.

Bietti, Giambattista. Bilateral blepharochalasis, dacryoadenoptosis and dacryops in a subject affected by hypothyroidism. *Boll. d'Ocul.*, 1936, v. 15, May, pp. 514-524.

A boy of fifteen years showed redundant skin of both upper lids, over-

hanging the lid margin at the outer end. Temporally there was a cystic formation beneath the conjunctiva, which appeared to be the lower end of the palpebral lacrimal gland, the whole gland seeming to be displaced downward. The patient showed symptoms of hypothyroidism, which was accepted as cause of the ocular manifestations. (Bibliography, 2 figures.)

M. Lombardo.

Dickey, C. A. Superior-rectus fasciata sling in the correction of ptosis. *Amer. Jour. Ophth.*, 1936, v. 19, Aug., pp. 660-664; also *Trans. Pacific Coast Oto-Ophth. Soc.*, 1936, 24th annual meeting.

Franceschetti, A. Chronic dacryocystitis following maxillary sinusitis. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 27-32.

Three operations failed to heal a fistula from a lacrimal sac. At the fourth operation a tract was located that communicated with the antrum. Repair of this condition effected a cure.

P. J. Leinfelder.

Hildreth, H. R. Surgical-diathermy extirpation of the lacrimal sac. *Amer. Jour. Ophth.*, 1936, v. 19, Aug., pp. 699-700.

Humbert, R., and Rossano, R. Clinical and electrical study of a case of partial hereditary and familial facial diplegia. *Ann. d'Ocul.*, 1936, v. 173, May, pp. 369-381.

A man of 31 years had had bilateral weakness of the facial muscles since birth. The face had a masklike expression suggestive of paralysis agitans. There was ptosis with inability to close the lids firmly. Reflexes involving the orbicularis oculi were diminished or absent. Detailed chronaxiometric studies of the facial muscles were made. The same type of facial diplegia was present in the father, a brother, a niece, and a nephew of the patient.

John C. Long.

Krause, J. Alternating current used dielectrically, so-called short-wave the-

rapy, in ophthalmology. *Zeit. f. Augenh.*, 1936, v. 89, July, p. 266.

According to Schliephake, this form of alternating current with a frequency of 10 to 100 million differs from diathermy in that the heat develops in the smallest particles of the dielectric body. The method has been but slightly used in ophthalmology. The most promising results have been in cases of lid abscess and tear-sac phlegmon. The author limited himself to lesions of this nature and gave only two to four treatments, because he believed that this form of therapy should show prompt success if of any value. Though his series is small, the results are so striking and unequivocal that he recommends the treatment. It must begin very early. Tear sacs phlegmons that have spontaneously perforated do not respond. It seems unlikely that the treatment endangers the eyeball, in view of Schliephake's irradiation of the brain and the animal experiments which Krause reports in this paper.

F. Herbert Haessler.

Moretti, Egisto. Contribution to the surgery of relapsing trichiasis of the lower lid. Author's reprint from *Trans. 33rd Congress of Società Oftalmologica Italiana*.

A skin incision is made 2 mm. from the lid margin and extending the whole length of the lid. After ample excision of the orbicularis muscle, the follicles of the eyelashes are cauterized and the skin is sutured. In 36 cases excellent results were obtained. W. H. Crisp.

Puscariu, Eléna. Cicatrization without ectropion, by the use of Carrel dressings, following large sloughs of the lids. *Arch. d'Opht.*, 1936, v. 53, July, p. 536.

The author has found the Carrel-Dakin treatment of gangrenous lid sloughs very efficient and the resultant scar practically nil. From one to four tubes are introduced (depending on the size of the lesion) and covered with a sterile bandage. It is almost always necessary to make a medial tarsorrhaphy. Two cases are reported in detail. (Illustrations.) Derrick Vail.

Trainor, M. E. Operation for lid ptosis. Trans. Sec. on Ophth., Amer. Med. Assoc., 1935, 86th annual session, p. 93.

Trainor's method consists in anchoring the upper tarsus to the superior rectus tendon by dissecting a tongue of the upper margin of the upper tarsus which is passed through a loop of the superior rectus tendon brought into the wound by squint hook traction. Good results are claimed, although the lids are not entirely closed during sleep. (Discussion, 3 figures.)

George H. Stine.

15

TUMORS

Agnello, Francesco. Basal-cell epithelioma of the limbus. Rassegna Ital. d'Ottal., 1935, Nov.-Dec., v. 4, p. 801.

There is brief review of the vast literature of epibulbar tumors. Their predilection for the limbus is discussed. Such a case was diagnosed clinically as papilloma but histologically proved epithelial. There were polymorphous cells, deposited in islands and divided by fine strands of connective tissue. The apparent discrepancy between the microscopic and clinical picture affords the author an opportunity to review the numerous classifications of these tumors. He advises marked conservatism in treatment, because of the relative benignity. (5 figures.)

Eugene M. Blake.

Claes, E. M.-J. Tumor of the semilunar fold. Bull. Soc. Belge d'Opht., 1935, no. 71, p. 181.

These tumors are relatively rare. The author reports one about the size of a grain of wheat, brownish, congenital; the patient 54 years old. She classes the tumor among the conjunctival cystic nevi. (Bibliography, 2 photomicrographs.)

Jerome B. Thomas.

Collenza, Domenico. Palpebral melanosisarcoma of tarsal origin. Boll. d'Ocul., 1936, v. 15, May, pp. 501-513.

A man of 36 years showed a hard tumor-like formation at the inner third of the left upper lid. Through the skin,

which was movable over it, the mass appeared to be of blackish color. The adjacent tarsal and bulbar conjunctiva was melanotic. Upon microscopic examination the neoplasm was diagnosed as a sarcomatous melanoblastoma. Five months after removal of the parts affected no relapse was visible. (Bibliography, 4 figures.)

M. Lombardo.

Landan, Jakob. Astigmatism with epibulbar tumors. Zeit. f. Augenh., 1936, v. 89, July, p. 288.

In a case of congenital tumor of the corneoscleral border, a dermoid, astigmatism decreased after removal of the mass. In a second case the astigmatism increased with continued growth of recurrence of epithelioma at the limbus. Very little is mentioned in the literature on the development of astigmatism incidental to epibulbar masses.

F. Herbert Haessler.

Mecca, Mario. Ocular complications of leukemic lymphadenosis. Ann. di Ottal., 1936, v. 64, May, 326.

The author reports on a case of leukemic lymphadenoma in which the ocular symptoms were retrobulbar and conjunctival with involvement of the lymphatic glands. He considers the views of other authors as to the nature of these enlargements and critically discusses various views as to differential diagnosis. In the case studied, instead of the lesions being in the form of diffuse infiltrations, there were small circumscribed tumors covered by a tenuous conjunctival layer. (One plate, bibliography.)

Park Lewis.

Pergola, Alfredo. Angiomatous polyp of the lacrimal caruncle. Rassegna Ital. d'Ottal., 1935, v. 4, Nov.-Dec., p. 782.

The polyp, in a child of eleven months, measured 5 by 10 mm. The author describes the clinical and histologic characteristics, and gives the differential diagnosis of other benign growths of this structure. Microscopically the growth was a loose connective tissue, with infiltration by leucocytes and numerous capillaries. (3 figures.)

Eugene M. Blake

Pfeiffer, R. L. Roentgenographic diagnosis of retinoblastoma. Trans. Amer. Acad., Ophth., and Otolaryng., 1935, 40th annual meeting, p. 131. (See Amer. Jour. Ophth., 1936, v. 19, Sept., p. 830.)

Puscariu, Eléna. Epithelioma of the upper tarsal conjunctiva. Arch. d'Ophth., 1936, v. 53, June, p. 427.

A man of 62 years had for two years a swelling of the left upper lid, beginning as a small tumor in the tarsal region and growing, especially rapidly for the past year, until the entire upper and lower lid region was involved. Clinically it resembled the usual epithelioma. Microscopically it was considered a cylindroma. (Illustrations.)

Derrick Vail.

Smaltino, Michele. Considerations on a case of glioma of the retina cured by radiotherapy. Boll. d'Ocul., 1936, v. 15, May, pp. 551-568.

A boy of six years had bilateral partial retinal detachment with glioma. Because of glaucomatous symptoms the right eye was enucleated. The clinical diagnosis was confirmed with the microscope. The left eye, which had normal vision, was submitted to radiotherapy, which controlled the progress of the tumor without injuring the lens or other structures of the eyeball. The cure of the glioma appears to be permanent after several years. (Bibliography.)

M. Lombardo.

Weekers, L., and Joiris, P. Radium treatment of epithelial epibulbar tumors. Bull. Soc. Belge d'Ophth., 1935, no. 71, p. 141.

The authors report four cases. Although enucleation may give good temporary results, local recurrence of the neoplasm is apt to occur. Radiotherapy offers evident advantages in an attempt to save the globe. Dosage is important and is far from being determined exactly.

Jerome B. Thomas.

16

INJURIES

Baratta, O. Ocular lesions following an electric flash. Ann. di Ottal., 1936, v. 64, May, p. 299.

The author describes three cases of cataract following electric shock; two of them bilateral, with a histologic report on the extracted lenses; the third stationary with a tendency to retrogression, associated also with paralytic miosis, a condition of extreme rarity. From pharmacodynamic study of the pupillary reaction the author deduces the pathogenesis in this form of cataract and the incidental ocular lesions. (Bibliography.)

Park Lewis.

Connole, J. V. Lightning and electric cataracts. Pennsylvania Med. Jour., 1935, v. 38, Sept., p. 939.

Connole reports a case of lightning cataract and concludes that the opacities may be in the anterior or posterior part of the lens, although most frequent in the former position. One or both lenses may become affected. There may be a latent period of two years during which the cataract appears. Voltage varying from 220 to 50,000 may produce a cataract.

Theodore M. Shapira.

Davidson, M. The minor sequelae of eye contusions. Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 757-769.

Djacos, G. A case of electric cataract. Arch. d'Ophth., 1936, v. 53, June, p. 454.

A telephone mechanic accidentally touched a live wire to the right eyelids and sustained a severe shock. He was not unconscious. No external ocular lesion was immediately noticed, but a month later the vision of the right eye became progressively worse. Examination showed typical heterochromia iridis with uveitis and posterior subcapsular lenticular opacity in the right eye. After a few months the eye and also vision improved. The author maintains that the biomicroscopic findings in electric cataract are not always the same.

Derrick Vail.

Jaeger, E. Technical procedure in extraction of magnetic foreign bodies from the anterior chamber. Klin. M. f. Augenh., 1936, v. 97, July, p. 75.

After an intraocular foreign body has been drawn with the giant magnet into

the lower sinus of the anterior chamber an assistant attracts it with the hand magnet to the center of the cornea and holds it there. A lance keratome is carried through the upper limbus to the center of the pupil and held so that no aqueous escapes. The tip of the hand magnet is applied to the wound. The knife becomes magnetic and the foreign body attaches itself to the outer surface of its blade and is removed with it, the magnet tip remaining in light contact with the knife. C. Zimmermann.

Leinfelder, P. J., and Kerr, H. D. Roentgen-ray cataract. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 739-755.

Leplat, Georges. Biologic action of the different forms of radiant energy on ocular tissues. *Ann. d'Ocul.*, 1936, v. 173, June, pp. 433-452.

Radiant energy produces an effect upon ocular structures only when absorbed. The tissues may be influenced either by direct alteration of molecular structure or by alteration of the cells. If the energy acts on vulnerable structures for a sufficient length of time there ensue imbibition, cytoplasmic and nucleoplasmic autolysis, coagulation of proteins with resulting opacification of the lens or cornea, and finally vascular lesions. After an initial vasodilatation there may be obliteration of the vessels with ischemia. The tissues of the eye in their reaction to radiant energy follow the laws of general biology. John C. Long.

Mieses-Reif, Marja. Two cases of hypersensitivity to henna. *Zeit. f. Augenh.*, 1936, v. 89, June, p. 224.

In two women who dyed their eyelashes with henna, a tremendous swelling of lids and conjunctiva followed. In one of them the superficial corneal tissue became eroded. Healing occurred in three weeks.

F. Herbert Haessler.

Raverdino, Emilio. Forceps extraction of traumatic cataract. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, p. 215. (See Section 9, Crystalline lens.)

Rossi, Giuseppe. Effects of compressed air upon the eyes of animals. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Sept.-Oct., p. 657.

The author exposed rabbits to the action of compressed air, using a chamber especially constructed for this purpose. The following ocular changes were observed: (1) increase of intraocular tension, (2) a tendency to miosis, (3) decrease of the photomotor reflex, (4) conjunctival hyperemia and secretion, (5) diminution of corneal sensibility, and (6) hyperemia and edema of the anterior uveal tract. There was no evidence of injury to the deeper ocular structures. The changes observed are attributed to modification of intraocular circulation and disturbances of the central nervous system by gaseous emboli. Eugene M. Blake.

Sanctis, G. E. de. Diathermocoagulation in iris prolapse. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 447-460.

Through a corneal wound iris prolapse was obtained in seven rabbits. Bipolar diathermocoagulation was applied to the prolapse with varied intensity. The prolapse took a dark gray discoloration and retracted to the level of the corneal surface. Histologic examination of the scar tissue is described. No disengagement of the anterior synechia was obtained. Only mild current must be used, to avoid otherwise grave lesion of ocular tissues. Diathermocoagulation is indicated in old prolapses. In recent ones surgical excision is to be preferred, especially since in this way the synechia is freed. (Bibliography, 3 figures.)

M. Lombardo.

Smith, F. W. G. Granuloma of the bulbar subconjunctival tissue arising from an imbedded cilium. *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 455-457.

An unpigmented mass about 4 mm. from the outer limbus of the right eye, in a woman aged 66 years, appeared adherent to both conjunctiva and sclera. The swelling had been apparent for six weeks and was steadily increasing in size. Examination revealed an imbedded cilium, which was easily re-

moved with a needle. After the cilium was found, the patient stated that the condition might have arisen following an explosion from an open coke fire. It is the opinion of the author that a piece of coke drove an eyelash through the conjunctiva. (One drawing.)

D. F. Harbridge.

Trattner, S. Chemical injury to cornea in new-born with report of experiments. *Virginia Med. Monthly*, 1935, v. 62, June, p. 163.

In a new-born negro the eyes were treated prophylactically at birth with silver nitrate stronger than the usual one percent solution. The left cornea failed to recover completely, in spite of vigorous treatment with various subconjunctival injections. Trattner concludes that subconjunctival injection as a therapeutic measure may have an adverse effect. Theodore M. Shapira.

Van Duyse and Canneyt. Does traumatism favor appearance of experimental syphilitic manifestations (primary and metastatic) of the eye, and can it aggravate existing lesions? *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 143-151. (See *Amer. Jour. Ophth.*, 1935, v. 18, Nov., p. 1079.)

Vormann. Contribution to A. Vogt's late contusion rosette. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 819.

The anterior portion of the left lens of a woman of 56 years showed in its depth a serrated opacity with seven dentations which consisted of minute white dots. Undoubtedly it was a Vogt's late contusion rosette, probably caused by a blow on the eye 37 years previously. (Illustrated.) C. Zimmermann.

17

SYSTEMIC DISEASES AND PARASITES

Abdulaev, G. G. Ophthalmohelminthosis. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 5, p. 716.

Two unusual cases. A student suffered for twelve years from recurrent attacks of inflammatory edema of the right upper lid. A growth in the lid was

diagnosed as lipoma, but on excision it proved to be an encapsulated filaria. In the other case a retrobulbar echinococcus cyst the size of a pigeon's egg produced displacement of the eyeball and limitation of motion. Ray K. Daily.

Avizonis, P. A case of ophthalmomyiasis interna migrans. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 152-156.

In this case of diptera larva in the anterior chamber of a boy of nine years, the signs were severe iritis with much fibrin in the anterior chamber. With healing the larva was seen, but it disappeared before an operation could be done for its removal. (Illustrations.)

P. J. Leinfelder.

Baratta, Orazio. Visual field, retinal arterial pressure, and intraocular pressure in pregnancy and puerperium. *Boll. d'Ocul.*, 1936, v. 15, May, pp. 580-597.

In tabulated form the writer gives results regarding thirty women. In 13.37 percent of the cases the visual field was contracted. In 76 percent intraocular pressure was normal while the retinal arterial pressure was increased. The author connects the contraction of the visual field with changes in the retinal arterial system rather than with hypertrophy of the hypophysis. (Bibliography.) M. Lombardo.

Dubois-Poulsen, A. Functional examination of the kidney and ophthalmology. General review. *Ann. d'Ocul.*, 1936, v. 172, April, pp. 298-317, and May, pp. 387-399.

This is a very detailed general review of the various methods of studying kidney function, with a discussion of the significance of the findings to the ophthalmologist. Determinations involving urinary contents, chemistry of the blood plasma, power of excreting various substances, water metabolism, and acid-base equilibrium are considered. There is a discussion of the significance of findings in glaucoma, retinal detachment, and renal and diabetic retinitis. (Bibliography.)

John C. Long.

Gilbert, W. Relations of affections of the fifth nerve to intraocular operations. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 70.

A woman of 57 years had suffered for years from obstinate neuralgia of the right side of the head without involvement of the eye. The third day after successful extracapsular extraction in the right eye a severe herpes iridis set in with subsequent formation of a pseudomembrane. About six months later removal of the secondary cataract with de Wecker's scissors was followed by intense hemorrhage into the anterior chamber, which for four months recurred two or three times a week. Vision rose to 5/35 but deteriorated from hypertension, which could not be relieved by trephining. On account of constant neuralgia the almost blind eye was enucleated at the patient's request. The author assumes that the herpes virus invaded the fifth nerve endogenously. Chronic neuritis in the ciliary nerves produced the neuralgia without involving the eye, until the intraocular operation affected the terminal branches of the ciliary nerves. Trigeminal neuralgia must be considered a contraindication to intraocular operation until at least six months after the last attack.

C. Zimmermann.

Inman, W. S. The emotional factor in the causation of diseases of the eye. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 423.

The author emphasizes the emotional etiology of glaucoma, epiphora, concomitant squint in childhood, and recurring inflammations. A number of case reports are given, which apparently corroborate the author's contentions. An endocrine basis is suggested.

Beulah Cushman.

Jayle, G. E., and Mastier, P. Ocular symptoms and complications of papular fever. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 273-279.

The authors report three cases of this exanthematous fever of coastal regions in which ocular symptoms and compli-

cations were noted. A mild conjunctivitis may be a symptom of the disease, and may be accompanied by superficial ulceration of the cornea. The conjunctiva may also be the site of inoculation (an unidentified virus), in which event the appearances are similar to those of acute Parinaud's conjunctivitis. A neuroretinitis occurs as complication of the disease.

P. J. Leinfelder.

King, E. F. Ocular involvement in a case of periarteritis nodosa. *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 246.

The author reviews the literature and gives the histological findings in one case. This man suffered from periarteritis nodosa, the diagnosis being established by pathologic examination of nodules from skin and muscles. During the course of his illness he developed in one eye marked papilledema which subsided completely but resulted in considerable atrophy, and in the other recurrent iritis leading to secondary glaucoma which necessitated removal of the eye. Pathologic examination of this eye revealed intense subacute uveitis, and in the retina infection involving particularly the arteries and periarterial zones. (Illustrations.)

Beulah Cushman.

Kunz, Eberhard. Concerning the knowledge of immunizing processes in ocular tuberculosis. Model experiments regarding the formation of complement-fixing antibodies. *Arch. f. Augenh.*, 1936, v. 109, June, p. 706.

The author investigated the part that an active tuberculous focus in the eye plays in furthering an active immunizing process. Into the anterior chamber of a number of rabbits a certain quantity of an emulsion of killed tubercle bacilli was injected and the complement-fixing properties of the blood serum and aqueous with the antigen were repeatedly determined. The complement fixation was held to indicate formation of antibodies.

Into the anterior chamber of one group of rabbits a single large dose (2 mg.) of the emulsion was injected. This produced a severe local reaction lead-

ing to phthisis bulbi. In a second group a mild chronic inflammatory process was maintained by constantly repeated small doses (0.02 to 0.05 mg.). The animals remained healthy and no metastases were found at autopsy. Nine days after the injection the blood serum showed positive complement fixation. This became strongest after nine weeks and remained mildly positive up to twenty weeks. The aqueous became positive only after four weeks and so remained as long as aqueous humor was obtainable. The serum of animals of the group treated with mild doses became positive occasionally two or three weeks after an increased inflammation. The aqueous humor, however, remained negative throughout. The author argues that the antigen from the focus in the eye enters the blood stream, and that the cells of the whole body, but mainly the reticulo-endothelial system, construct the antibodies. A high concentration of antibodies must be present in the blood to pass the blood-aqueous barrier. Local immunity develops later. It is of clinical importance that a focus in the eye may not suffice for stimulation of antibodies ample to pass the barrier.

R. Grunfeld.

Mieses-Reif, Marja. A case of hypersensitivity to hemp. *Zeit. f. Augenh.*, 1936, v. 89, June, p. 226.

A 41-year-old female who had previously had mild reactions to hemp worked all day in the hemp field. Tremendous swelling of the skin of her whole body followed. Three weeks later desquamation began, and when she was again able to open her eyes she could not see. The corneae were covered with ulcers; iris and pupil were barely visible. Healing occurred with corneal scars, symblepharon, trichiasis, and deformed lids. F. Herbert Haessler.

Rapisarda, Dante. Behavior of pupillary diameter, amplitude of accommodation, and ocular tension in fatigued subjects. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 461-481.

In tabular form the writer gives the results of experiments in 35 fatigued

young subjects. He noted: (1) enlargement of the pupillary diameter, which according to him is due to a stimulus of sympathetic nature on the iris dilator either directly or by ischemia of the radial blood vessels of the iris; (2) a diminished amplitude of accommodation due to products of muscular metabolism; (3) a lowered intraocular tension due to diminished blood supply. (Bibliography.) M. Lombardo.

Riad, M. Ocular leprosy. *Bull. Ophth. Soc. of Egypt*, 1935, v. 28, p. 16.

Ocular complications in leprosy usually appear as a late manifestation of the disease. Four distinct types of keratitis can be identified (1) leprotic pannus, (2) superficial punctate keratitis, (3) leproma of the cornea, (4) interstitial leprotic keratitis. The uveal tract is affected much less frequently in the nerve type than in the nodular and mixed forms of leprosy. No pathologic fundus changes were seen among 108 cases. The retina and choroid are not primarily affected.

Edna M. Reynolds.

Rohrschneider, W., and Reiners, H. Evaluation of pulmonary conditions in eye diseases of suspected tuberculous origin. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 778.

Out of 72 adult patients chiefly affected with uveitis, 64 presented slight remnants of a former tuberculous process, six a formerly active but at present entirely inactive process in the lungs, two an active pulmonary tuberculosis requiring treatment. As such pulmonary conditions are also with great regularity observed in adults with healthy eyes they do not allow a definite conclusion as to the etiology of the eye disease. C. Zimmermann.

Sala, Guido. Ocular changes in Paget's osteitis deformans. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 437-446.

A woman of 61 years about a year earlier had suffered an attack of intense headache and vomiting, with edema of the cheeks. She had since been subject to rheumatic pains. The writer's examination showed marked edema of the

lids, exophthalmos, slight bilateral nystagmus, pallor of the discs, and total blindness. Roentgenographs showed thickening of the cranial base with lowering of the upper wall of each orbit. The reduction of orbital space had provoked the bilateral exophthalmos, thickening of the optic canals had compressed the optic nerves, and pressure on the blood vessels had caused the lid edema. According to some authors Paget's disease is a chronic rheumatic osteitis. (Bibliography, 2 figures.)

M. Lombardo.

Soliman, A. M. Effect of endemic diseases on the eye. *Bull. Ophth. Soc. Egypt*, 1935, v. 28, p. 9.

In a series of 156 cases of ankylostoma and ascaris infection, trachomatous infection was found to excite a much less marked reaction than in relatively healthy patients. The conjunctiva showed less contracture and shrinking and the corneal complications were less pronounced. Extracapsular extraction of cataract in patients suffering from ankylostomiasis was followed by almost no reaction, in marked contrast with the iritis which nearly always follows such extraction in normal persons. The author believes that the so-called ankylostoma cataract is a misnomer, because a large number of ankylostomiasis cases show no lens changes.

Edna M. Reynolds.

Stroobants, Ch. Subconjunctival filaria. *Bull. Soc. Belge d'Opht.*, 1935, no. 71, p. 213.

(A case report.)

Tita, Carlo. A case of conjunctival myiasis (*Oestrus ovis*). *Rassegna Ital. d'Ottal.*, 1935, v. 4, Sept.-Oct., p. 613.

While a 25-year-old shepherdess was milking a goat a kid standing near by sneezed into the woman's face. She immediately felt symptoms of severe conjunctival irritation, as by a foreign body. A neighbor washed out seven worm-like objects, but continued irritation caused the patient to present herself for treatment. Two further motile, segmented, grayish-yellow larvae were

removed. These were identified as larvae of the gadfly, sub-group *Oestrus ovis*. (One figure.) Eugene M. Blake.

Toulant and Sarrouy. The ocular manifestations of the bacillary dysenteries. *Arch. d'Opht.*, 1936, v. 53, July, p. 523.

This short monograph comprises a summary of the literature and description of a few cases. The most frequent form is the scleroconjunctival involvement, coinciding very frequently with arthritis, appearing ten to twelve days after onset of the disease, and frequently after the intestinal symptoms have disappeared. Iritis is rarer, and it often appears between the twentieth and the thirty-fifth day. It is generally mild though plastic in character. Cyclitis is often associated, but never produces hypertension. Ulcers of the cornea, oculomotor palsies, and choroidal hemorrhages have been observed. It is unknown whether the pathogenesis of ocular complications is toxic or bacterial. Secondary invaders are frequent. (Bibliography.)

Derrick Vail.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Abeloos. The first amblyope class in Belgium. *Bull. Soc. Belge d'Opht.*, 1935, no. 71, p. 248.

The methods adopted for this sight-saving class in Belgium resemble those used in other countries.

Bahn, C. A. Popular beliefs and superstitions about eyes. *New Orleans Med. and Surg. Jour.*, 1935, v. 88, Nov., p. 270.

An interesting, amusing article discussing the layman's beliefs with regard to the eyes. Bahn attempts to explain the origin of some of these superstitions. Theodore M. Shapira.

Eydelnanth, J. S. The formula of Ostrooumoff for evaluation of loss and capacity for work in cases of diminished vision. *Ann. d'Ocul.*, 1936, v. 173, June, pp. 469-476.

This formula for evaluating visual loss in the U.S.S.R. is based on a modification of Zehender's formula. It is considered that total loss of one eye disables the individual 33 percent. An index table corresponding to visual acuity was prepared by taking the percentage difference between the different visual acuities expressed in tenths. The formula follows: $X = (2a + b) 0.1068$; X being the percentage loss of capacity for work, a the index corresponding to the visual acuity of the better eye, and b the index of the more defective eye. Final evaluation of capacity for work must be made by the tribunal, which considers the occupation of the injured person. John C. Long.

Kraupa, Ernst. St. Yves and his nephew. *Zeit f. Augenh.*, 1936, v. 89, June, p. 223.

St. Yves willed his entire estate to Leoffroy, an oculist who married St. Yves's cook. Palmier, who was the only nephew and pupil and assistant of St. Yves, so stated on his door sign, and Leoffroy tried to prevent him from doing so. Palmier brought suit. The court decreed that Palmier had a right to advertise his relation to St. Yves and that Leoffroy could not adopt the name "St. Yves." He did, however, retain the cook and the fortune of one-half million livres. F. Herbert Haessler.

Lehrfeld, Louis. Eye physicians selling light. *Amer. Jour. Ophth.*, 1936, v. 19, Aug., pp. 700-702.

Natanson, D. M., and Winogradov, D. P. The effect of red light on photographers. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 6, p. 852.

The author studied the visual functions of 21 workers who spent the greater part of the eight-hour working day in the development room, which is poorly illuminated with a red light. All of them were found to have chronic conjunctivitis with hyperemia. No impairment of visual function could be demonstrated. Ray K. Daily.

Scalinci, Noè. The *Ars Probatissima Oculorum* of Benvenuto Grasso of the

School of Salerno, XII Century. *Ann. di Ottal.*, 1936, v. 64, Feb. pp. 116-139, and March, pp. 188-208.

This was the first published volume on ophthalmology. Scalinci's scholarly critique on the work of the greatest of medieval ophthalmologists should be read in conjunction with the only English translation extant, that by Casey A. Wood. Scalinci gives a dissertation on all of the known writings of Benvenuto Grasso of Jerusalem as summarized early in the present century by Albertotti.

Benvenuto probably wrote in Hebrew. The treatise appeared in Provençal, old French, and old English, and was soon translated into Latin. Scalinci believes the author to have much originality and analyzes his nosology and therapy. In an earlier essay Scalinci had considered Benvenuto's surgery. Benvenuto influenced ophthalmic development through translations of his writings during the 12th, 13th, 14th and 15th centuries.

Park Lewis.

Tyrrell, S. M. A visit to an ophthalmic clinic in Vienna. *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 458-460.

The visit described was to the Meller clinic. D. F. Harbridge.

Usher, C. H. On a few hereditary eye affections (Bowman Lecture). *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 164.

The author takes up the part played by heredity in choroideremia, gyrate choroidal and retinal atrophy, retinal angiomas, ptosis, and epicanthus. He presents an unusual pedigree of retinitis pigmentosa. The historical review includes abstracts of cases and pedigree charts. The statement that choroideremia and gyrate atrophy are different stages of the same disease found favor, as gyrate atrophy was seen on the average in patients ten years younger than those suffering from choroideremia, and visual fields were more often contracted in choroideremia. Wernicke's case of gyrate atrophy of the choroid is referred to. In it the left

fundus resembled choroideremia, and the right fundus gyrate atrophy of middle grade. Opposing this view is the occurrence of choroideremia in twenty-one males to one female and of gyrate atrophy in 15 males to 11 females.

Beulah Cushman.

Vittadini, Angelo. The conception of myopia by a nineteenth century hygienist. *Rassegna Ital. d'Ottal.*, 1935, v. 4, Sept.-Oct., p. 674.

This historical review of the work of an unknown oculist, published by Antonio Fortunato Stella of Milan in 1825, was translated by Carlo Donegana, a surgeon oculist and obstetrician of Como, and by him dedicated to the editor. The article does not lend itself to abstract.

Eugene M. Blake.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Jegorow, I. G. The blood vessels of the cornea and their innervation. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 6, p. 832.

A detailed description of the blood-vessels and nerves of the guinea-pig cornea. In numerous successfully stained preparations the various branches may be seen to arise from the nerve plexuses surrounding the blood vessels; some of these branches end in the connective tissue, while others pierce Bowman's membrane and end among the epithelial cells. These fine branches arising from the perivascular plexuses belong to the vegetative nervous system.

Ray K. Daily.

Roberto, S. The sclerotic protuberance in the eye of the fetus. *Boll.*

d'Ocul., 1936, v. 15, June, pp. 699-704.

From examination of thirty fetuses between the fourth and ninth months the writer comes to the conclusion that a real posterior protuberance of the sclera as recognized by Ammon does not exist. There occurs only a greater distension of the posterior temporal segment of the globe as distinct from the nasal distension which leads to eccentric implantation of the optic nerve. (Bibliography, 5 figures.)

M. Lombardo.

Stilo, A. A study on reticular fibers of the human lid. *Boll. d'Ocul.*, 1936, v. 15, May, pp. 569-579.

The writer gives a description of the reticular tissue as found in different structures of the upper and lower lids and as modified by age from the first days of extrauterine life to 92 years. (Bibliography, 4 figures.)

M. Lombardo.

Winckler, Georges. Double innervation of the extrinsic muscles of *Sus scrofa domesticus* and *Sus scrofa*. *Ann. d'Ocul.*, 1936, 173, June, pp. 453-467.

The extrinsic eye muscles of the hog and wild boar were dissected with special reference to their nerve supply. In both animals it was very easy to demonstrate a double nerve supply—motor and proprioceptive. The latter fibers leave the muscle independently of the motor nerves and join the trigeminal nerve. With few exceptions the motor nerve enters the muscle on the side opposite the sensory nerves. There is a general discussion of the mode of innervation of the ocular muscles.

John C. Long.

NEWS ITEMS

Edited by H. ROMMEL HILDRETH
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month

Deaths

Dr. Clarence King, Cincinnati, died August 15, 1936, aged 57 years.

Dr. Philip Abernathy Graves, Oak Park, Ill., died July 17, 1936, aged 63 years.

Dr. Marion Earle Brown, New Orleans, died August 19, 1936, aged 50 years.

Miscellaneous

The Bureau of Human Heredity, 115 Gower Street, London, W.C. 1, England, issues the following announcement: The object of this Bureau is collection on as wide a scale as possible of material dealing with human Genetics. Later, the tasks of analysis of material and distribution of the information available will be added. The Bureau is directed by a Council representing medical and scientific bodies in Great Britain. It is affiliated with the International Human Heredity Committee, which ensures coöperation in all areas where research is proceeding. The Council would be grateful to receive all available material from institutions and individuals, furnishing well-authenticated data on the transmission of human traits whatever these may be. Pedigrees are particularly desired; twin studies and statistical researches are also relevant. As research workers and others who send in material may in some cases wish to retain the sole right of publication (or copyright) those who so desire are asked to accompany their material with a statement to that effect. Material should be given with all available details in regard to source, diagnostic symptoms, and the name and address of the person or persons who vouch for accuracy. All such details will be regarded as strictly confidential. Reprints of published work would be most acceptable. Furthermore, many authors when publishing material may also have collected a number of pedigrees which they have been unable to reproduce in detail. It is the object of the Council that such records, by being included in the Clearing House, should not be lost. Those wishing for a copy of the Standard International Pedigree Symbols may obtain one from the office. Announcements in regard to the services undertaken by the Bureau will be published from time to time. Chairman: R. Ruggles Gates. Executive Committee: R. A. Fisher, J. B. S. Haldane, E. A. Cockayne, J. A. Fraser Roberts, L. E. Halsey (Hon. Treasurer), C. B. S. Hodson (Hon. Gen. Secretary).

The International College of Surgeons, with headquarters in Geneva, Switzerland, wishes to announce that it will hold its first

examination for Membership and Fellowship sometime before January 1, 1937. In the United States the examinations will be held in New York City, Chicago, Durham, N.C., San Francisco, San Antonio, Texas, and Rochester, Minn. The recent announcement states that a Surgeon may receive the title of Member of the International College of Surgeons if he is over 30 years of age and passes the required examination. Such examination consists of a written test, a clinical bedside examination, an oral test and operations on the cadaver. The written examination papers will be prepared in Geneva and the same questions will be submitted to Surgeons in every country in the world. The examination for Fellowship is practically the same, except that a man may receive the Specialty Fellowship in any one of the various special branches of surgery. The applicant for Fellowship must be over forty.

Surgeons in the United States desiring to take the examination for either degree should send for an application form to one of the following Regents: Dr. Dean Lewis (National Regent), Prof. of Surgery, Johns Hopkins University, Baltimore, Maryland; Dr. John Erdmann, Prof. of Surgery, Columbia University, New York; Dr. Deryl Hart, Prof. of Surgery, Duke University, Durham, North Carolina; Dr. Frederick G. Dyas, Prof. of Surgery, University of Illinois, Chicago, Illinois; Dr. E. Eric Larson, Clinical Prof. of Surgery, University of California, Los Angeles, California; Dr. A. O. Singleton, Prof. of Surgery, University of Texas, Galveston, Texas. In Canada the examination will be held in Montreal, Quebec, and Toronto, Ontario. Candidates may receive examination application forms from the Dominion Regent: Dr. E. Archibald, Prof. of Surgery, McGill University, Montreal; Dr. D. E. Robertson, Assistant Prof. of Surgery, University of Toronto; Dr. Charles Vezina, Prof. of Clinical Surgery, Laval University, Montreal. The fee for examination will be \$250.00 and the same will be required of applicants in Mexico, Panama, and South American countries. Eighty percent of the fee will be returned to candidates who fail to pass the examination.

The American Medical Editors' and Authors' Association is anxious to bring about a closer relationship between author and publisher. The Director wishes to announce that articles on medical subjects may be submitted to him for editing in preparation for publication. This service will be rendered free of charge. The services of the library of the New York Academy of Medicine are available at all times. The author need not be

a member of the Association. Address all manuscripts to Dr. Harold Hays, Director of the American Medical Editors' and Authors' Association, 133 East 58th Street, New York City.

The Medical Library Association at its Annual Meeting, June 22, 1936, passed a resolution recommending the appropriation of adequate funds for the Army Medical Library and its Index-catalogue. It is important that Congressmen understand the fact that the whole medical profession does benefit by this great Library and its Index-catalogue. In recent years the annual appropriation of the Congress has been wholly inadequate to provide sufficient funds to acquire the current medical books and periodicals issued throughout the world, so that they might be available for use throughout the country and for inclusion in the Index-catalogue.

Societies

The Brooklyn Ophthalmological Society announces new officers for the year 1936-1937: president, Dr. Walter V. Moore; vice-president, Dr. E. Clifford Place; secretary-

treasurer, Dr. Mortimer A. Lasky; associate secretary-treasurer, Dr. Allen Hull.

The following program of the Scientific Meeting of the Eye Section of the Philadelphia County Medical Society was held October 8, 1936: Dr. Roscoe J. Kennedy: Presentation of cases with fundus changes related to the program topics. Drs. Glenn C. Gibson and P. Brooks Bland: Clinical significance of retinal changes in toxemias of pregnancy. Dr. Bernard J. Alpers: The neurologic aspects of optic and retrobulbar neuritis.

Personals

Drs. George Newton Hosford, and Avery Morley Hicks announce the opening of their new offices, 450 Sutter Street, San Francisco.

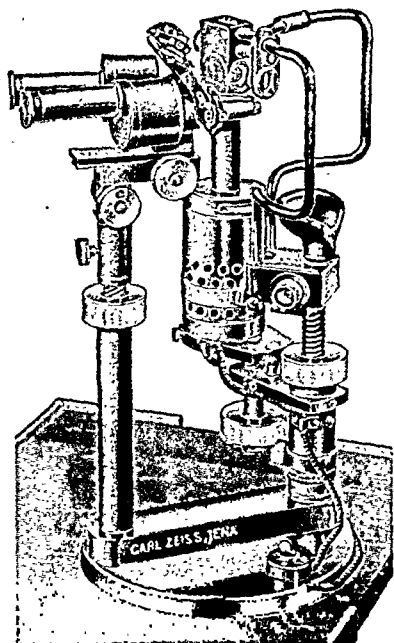
Drs. D. H. Trowbridge and Dwight H. Trowbridge, Jr., announce their association in the practice of ophthalmology in Fresno, California.

Dr. Harry S. Gradle has been appointed consultant ophthalmologist to the Indian Medical Service of the Department of the Interior.

ZEISS SLITLAMP

AFTER COMBERG

Latest Construction of Unique Design



Instantaneous control of Slit Image from 8 mm. circle to hairline width. Quick change from low to high power by revolving objective carrier. Increased intensity of light by the use of a 4.35 amp. Nitra bulb. Control of Slit Image length by easily accessible diaphragm. Immediate reduction of intensity or change of Redfree light. Independent setting of angle of illumination to Microscope axis. Coupling of Slitlamp and microscope at selected angle for joint lateral rotation.

Standard Equipment has 11.20.22 & 40 x magnification.

Price \$544.50

Instrument tables \$56.00

CARL ZEISS, INC.

485 Fifth Avenue
New York

728 S. Hill St.
Los Angeles

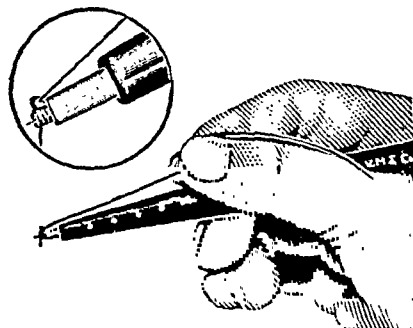


OPHTHALMIC HIGH FREQUENCY UNIT

For the treatment of Retinal Detachment

By CLIFFORD B. WALKER, M.D.

A distinguishing feature of the Walker Unit is its ability to produce an unprecedented minimum current volume with a wide enough latitude of control to assure accuracy of dosage. Entire control of current intensity is by one dial—by advancing or retarding this dial greater or lesser amounts of current are immediately available. Small, compact, portable, absolutely safe, and



easy to operate. The illustration on the top right shows the position of the bakelite handle in the hand with thread attached to the micro-pin and held between the thumb and index finger. Inset is an enlargement of the coil-like iridium platinum micro-pin with thread attached. Complete information sent on request.



V-MUELLER & CO.

SURGEONS' INSTRUMENTS Since 1895 HOSPITAL SUPPLIES & EQUIPMENT

OGDEN AVE - VAN BUREN and HONORE STREETS
CHICAGO, ILL.

The National Society for the Prevention of Blindness, Inc.

50 West 50th Street, New York, N.Y.

Offers films, slides, and exhibits, on loan free of charge, except for the cost of shipping.

FILMS

Preventing Blindness and Saving Sight—2 reels, 16 or 35 mm.

Shows vision defects and their correction; eye diseases, notably trachoma, and their prevention; rules for eye health through proper illumination, eye care, and preventive measures in childhood and old age; and industrial eye protection.

Popular treatment, suitable for lay audiences and for high schools, as well as for medical groups and medical social audiences.

SLIDES

Topics are as follows:

Ophthalmia Neonatorum

Trachoma

Accidents

Play Accidents

Illumination

School Children

Vision Charts

Sight-Saving Classes

The Blind

Preschool Children

General Topics

Technical Topics

Itemized lists will be sent on any topic, so that individual selection may be made. Borrower is responsible for breakage. Stereopticon slides may be borrowed free of charge or purchased at cost—35 cents each.

EXHIBITS AND DISPLAYS

Specially prepared material is available upon request. On making request, please indicate date for which material is needed, as well as space available and type of material required.

AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

Original Papers	Page
Aneurysm of the internal carotid artery with atrophy and compression of the optic nerve. John O. Wetzel	1053
Iritis produced in rabbits' eyes by the intravenous injection of crude and purified cultures of bacteria isolated from patients with certain inflammatory eye diseases. Conrad Berens, Edith L. Nilson, and George H. Chapman	1060
Tobacco amblyopia; alcohol amblyopia. Frank D. Carroll and C. Ray Franklin	1070
Results of the surgery of glaucoma. Louis Bothman and Marvin J. Blaess	1072
Ocular changes in multiple sclerosis. Don Marshall and R. G. Laird	1085
Glaucoma in amblyopia. Samuel V. Abraham	1094
The role of paracentesis in ophthalmology. William F. Hardy	1097
Unilateral congenital anophthalmos with orbitopalpebral cyst. Morris Rosenbaum	1101
Notes, Cases, Instruments	
Diathermy in cataract extraction. Theodore L. Terry	1105
Apparent increase of hyperopia up to the age of nine years. E. V. L. Brown	1106
Case of marked exotropia treated with strong concave lenses. Maurice L. Greene	1106
Society Proceedings	
Philadelphia, Minnesota, New England, Washington, D.C., Memphis	1109
Editorials	
Consecutive extraction of lens and capsule; The screen parallax for orthoptic training; The Teachers' Section of the Academy	1116
Book Notices	1119
Correspondence	1121
Abstract Department	1122
News Items	1146
Index for Volume 19	i

For complete table of contents see advertising page V

Copyright, 1936, Ophthalmic Publishing Company, 640 South Kingshighway, Saint Louis, Missouri

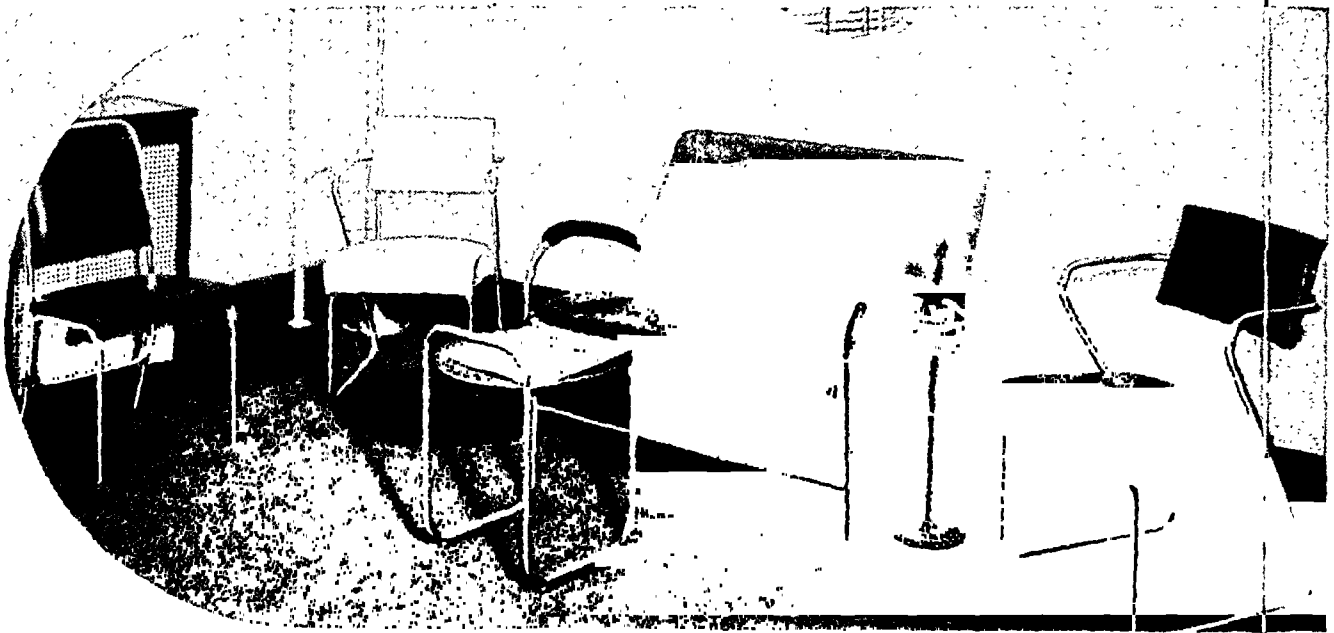
Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars.

Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company, 640 S. Kingshighway, Saint Louis, Missouri

Editorial Office: 640 S. Kingshighway, Saint Louis, Missouri

Entered as second class matter at the post office at Menasha, Wisconsin

Now YOU CAN COMPLETELY REFURNISH
YOUR RECEPTION ROOM WITH FINEST CHROMIUM FOR ONLY



\$98.75

Picture your reception room with modern chromium furniture. Imagine the ease and contentment of your patients as they wait for you in comfort amid pleasant modern surroundings. Realize how the smart appearance and cleanliness of chromium furniture impresses them. Think of the self satisfaction that comes from being marked as a progressive practitioner. Think how much all these things can mean to you—

Troy Furniture Is the Finest Chromium You Can Buy—The Troy Sunshade Company of Troy, Ohio, recognized leaders in Chromium furniture design and manufacture, make Troy Streamline Metal from the finest materials to the most exact specifications. It will give long, practical service and its smart styling is modern in good taste.

and then act. Send for your copy of Riggs' Troy Chromium catalog. In it you find a complete line of well designed, smartly styled furniture—at reasonable prices. For example—the attractive ensemble pictured above costs only \$98.75—payable over 20 months on a Riggs' convenient payment plan. Today, one can't afford to be old fashioned. Go modern in good taste with Riggs' Troy Streamline metal.

Only Riggs Offers This Service That Assures Beauty and Refinement. When desired, Riggs Decorating Service will suggest a complete color treatment for walls, floors and ceilings, to blend with the shades of upholstery selected for the streamline furniture. This assures you of proper color blending—a most important factor.

RIGGS OPTICAL COMPANY

General Offices • Merchandise Mart • Chicago, Illinois

ARTIFICIAL EYES

TRUE TO LIFE



Fitted with Reform Eye shortly after operation
Remarkable motion, no noticeable depression

LIFELIKE ARTIFICIAL EYES that match with wondrous fidelity the human eyes they companion. All the wealth of MODERN SCIENCE, plus the skill of our artisans who have spent a lifetime at their art . . . is at your service here. Leading Ophthalmologists have looked to us for a generation . . . for fit, comfort and enduring satisfaction, as well as PERFECT RESEMBLANCE.

SELECTIONS ON APPROVAL

For Ophthalmologists who prefer to do their own fitting from our large and complete stock of Blended Iris Reform and Shell Eyes.

EYES MADE TO ORDER

Exact Duplication Assured

Gold and Glass Spheres Carried in Stock

Our Experts Make Regular Visits to Principal Cities

FRIED & KOHLER, INC.

Specialists in Artificial Human Eyes Exclusively

665-5th Ave. near 53rd St.

New York City, N. Y.

"Over thirty-nine years devoted to pleasing particular people"

Merry Christmas



Nathaniel Singer



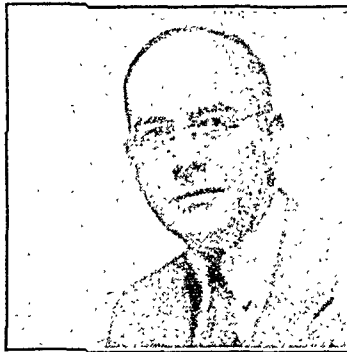
B. J. Lander



Elmer Robinson



J. H. Vernon



J. H. Remick



H. H. Brown



E. J. Sumner



Dan S. Tracy



P. W. Stone

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3, Vol. 19, No. 1

JANUARY, 1936

CONTENTS

Original Papers

	Page
The carbohydrate matrix of the epithelial-cell inclusion in trachoma. C. E. Rice	1
Sympathetic ophthalmia. Part I. Alan C. Woods	9
Bullous keratitis: a rational therapy. John Green	16
On the surgery of glaucoma: mode of action of cyclodialysis. Otto Barkan, S. F. Boyle, and S. Maisler	21
The Kayser-Fleischer ring in Wilson's disease and microcephaly. Louis Bothman and D. E. Rolf	26
Subjective studies of the blind spot and visual fields. Edward Jackson	34
The effects of mydriatics upon intraocular tension. Harry S. Gradle	37
Magnet extraction of intraocular foreign bodies. Ashley W. Morse	40

Notes, Cases, Instruments

Acute glaucoma secondary to relapsing fever followed by uveitis. W. H. Roberts	43
Photographically recording the phorias. Forrest J. Pinkerton and Thomas W. Cowan	44
An unusual vortex vein. Forrest J. Pinkerton and Thomas W. Cowan	45
A new conjunctival flap for trephining operations. F. H. Verhoeff	46

Society Proceedings

College of Physicians of Philadelphia, Section on Ophthalmology, January 24, 1935	47
College of Physicians of Philadelphia, Section on Ophthalmology, February, 1935	48
Colorado Ophthalmological Society, April 20, 1935	50
Minnesota Academy of Ophthalmology and Otolaryngology, Section on Ophthalmology, May 10, 1935	51
Royal Society of Medicine, London, Section on Ophthalmology, June 14, 1935	52

Editorials

Refraction in Europe and America	54
Adaptation and photophobia	55
The St. Louis meeting of the Southern Medical Association	56

Book Notices

An outline of ophthalmology	57
-----------------------------	----

Correspondence

The action of Levo-glucosan	58
-----------------------------	----

Abstract Department

Physiologic optics, refraction, and color vision; Ocular movements; Conjunctiva; Cornea and sclera; Uveal tract, sympathetic disease, and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus; Tumors; Injuries; Systemic diseases and parasites; Hygiene, sociology, education, and history; Anatomy and embryology	59
--	----

New Items	92
-----------	----



SHOULD THIS PATIENT WEAR BAUSCH & LOMB PANOPTIKS?

Mrs. Hazel Woodbury, age 52, housewife, does her own cooking, laundry and other housework; avocations, motion pictures and needlework. Prescription:

O. D. + 1.25 \ominus - 1.00 ax 175
O. S. + 1.00 \ominus - 0.75 ax 180
add +2.00 O.U.

Why should this patient wear Bausch
Panoptiks?

Answer on page Chicago, Illinois

THE CARBOHYDRATE MATRIX OF THE EPITHELIAL-CELL INCLUSION IN TRACHOMA

SURGEON C. E. RICE

United States Public Health Service

ROLLA, MISSOURI

Although the inclusions found in trachoma were first described by Von Prowazek and Halberstaedter in 1907, since then very little has been done to discover the nature and composition of these bodies.

This microchemical study of the Von Prowazek-Halberstaedter inclusion body found in the cytoplasm of epithelial cells from trachomatous conjunctivae indicates that this inclusion contains a high concentration of some carbohydrate. The evidence would seem to indicate that this carbohydrate is glycogen. The carbohydrate is a matrix in which are suspended or embedded the so-called initial bodies of Lindner and the elementary bodies of Von Prowazek. The questions raised from this study are: 1. What is the origin of the carbohydrate? 2. Why does it not quickly diffuse throughout the cytoplasm in preparations made to study fresh unfixed cells? 3. What is the significance of the fact that the inclusions found in inclusion-body blennorrhoea apparently have the same composition as the inclusions found in trachoma? 4. What is the relationship of the so-called elementary bodies of Von Prowazek and the initial bodies of Lindner to the carbohydrate matrix in which they are embedded? 5. If the carbohydrate of the trachoma inclusion is a cytoplasmic reaction to irritation from a visible or invisible virus, then do any of the other known virus diseases produce inclusions which are concentrations of glycogen? Read before the St. Louis Ophthalmic Society, October 25, 1935.

Since the inclusion body found in the epithelial cells of the trachomatous conjunctiva was first described, in 1907, by v. Prowazek and Halberstaedter¹ much work has been done in many parts of the world in attempting to ascertain the role played by this element in the etiology of trachoma. Opinions have varied widely as to the nature of the epithelial inclusion in this disease. Some workers have thought of it as merely phagocytosed bacteria.² Lately Thygeson³ has advanced the idea that the inclusion body represents a stage in the life cycle of a virus which is the etiological agent of trachoma.

This study represents an attempt to determine microchemically something of the nature of the v. Prowazek-Halberstaedter inclusion, regardless of whether it is specifically concerned with trachoma or not.

The work is based on observations on 17 patients having active trachoma hospitalized at the United States Trachoma Hospital, Rolla, Missouri. The ages of these individuals ranged from

six to fifty years. The duration of the disease varied from a few weeks to several years. Inclusion bodies were found in all. Two of the cases were of monocular trachoma, both being in adults. One of the seventeen is a professional wrestler.

In these studies, light scrapings were made from the palpebral conjunctiva without the use of any local anesthetic. Often these scrapings were made without drawing any blood and certainly without much discomfort to even young children. It was found to be important not to secure too much material on the dull scalpel blade used. A Beebe loupe was very useful, as the small amount of material on the knife blade might not have been visible without a slight magnification. Heat fixation of the specimen or fixation in 95-percent alcohol for 30 minutes was used.

Staining of fixed cells in a modified Lugol's solution. The iodine solution was made up of equal parts of Lugol's solution and tap water. This solution was run over the fixed smear, which

was then observed immediately without removal of the excess solution. In some of the epithelial cells, inclusion bodies were found in the cytoplasm, which gave a deep red-brown color reaction, while the cells stained hardly at all.

In looking over a fixed smear stained in this way, it is not necessary to wait for the slide to dry, as the iodine-color-reacting inclusion shows up better under low power with the slide still wet.

Fixed smears were next treated in a stronger iodine preparation, an unmodified Lugol's solution. The slides were left in the solution about two minutes, then dipped a few times in 95-percent alcohol containing 10-percent iodine, and finally dipped once in 80-percent alcohol and allowed to dry. These can be observed with oil-immersion lens. Figure 1 shows such an inclusion with the marked color reaction from the iodine solution. A faint outline of the nucleus can also be seen.

Figures 2 and 3 also illustrate how the deep red-brown stain of the inclusions appears under the oil immersion. This iodine stain may be used in rather thick smear preparations and the stained bodies easily identified. As is seen in the illustrations, the contrast between the inclusions and the general background is marked.

Staining of fresh unfixed cells with iodine. In staining unfixed cells, a still weaker solution of iodine was used. Too concentrated a solution of iodine would partly fix the cell, of course, and certainly hinder or even prevent the disappearance of the iodine-color-reacting substance from the inclusion, which is to be described later. One drop of Lugol's solution was mixed with 10 drops of normal saline. A drop or two of this very weak solution was placed on a slide and the material, secured by a very delicate scraping, placed in the drop. After a few seconds, a thin cover slip (no. 2) was dropped on and squeezed down as tightly as possible. The cover slip was ringed with melted vaseline and the specimen then observed.

The inclusions in the epithelial cells show the red-brown color as vividly

as in the fixed cells, as is illustrated in figure 4. In these wet preparations, the inclusions usually appear globular or circular in shape, and opaque, and may show such a dense iodine color reaction as to be homogeneous in appearance. If too much tissue is in the scraping or not enough of the solution has been placed on the slide, the inclusions may stain very faintly, as most of the iodine appears to be absorbed by the tissue present. It is well, after having teased the specimen in the drop of fluid, to add an extra drop of the weak iodine solution before covering with the cover slip.

The probable carbohydrate nature of the substance in the epithelial-cell inclusions giving the color reaction with iodine. The color reaction of the inclusions in the epithelial cells in the trachoma cases studied by the above methods, is thought to be due to the presence of a carbohydrate. The evidence would seem to indicate that this carbohydrate is glycogen. The evidence is as follows:

A. The color reaction is distinctly sharp, such as is given by Lugol's solution with some of the polysaccharides.⁴ The reddish-brown or amber color of this reaction is identical with that of pure glycogen when a small amount of glycogen is rubbed up with glycerine on a slide, a few drops of the iodine added, and a cover slip applied.⁵

B. In the wet preparations, if the slide is carefully heated over an alcohol lamp alongside the microscope and is then quickly observed, the vivid color will be found to have faded considerably in the inclusion; however, much of the color returns as the slide cools.

After adding iodine to a test tube containing either a glycogen or starch solution, the color reaction will fade with heating and reappear on cooling.⁶

C. In the wet preparation, the reddish-brown color fades and in 12 to 18 hours will usually be found to have entirely disappeared. The cell inclusions will not give the color reaction again when fresh iodine solution is introduced under the cover slip. This shows that the substance giving the reaction has either changed its nature or has

been dissolved out of the cytoplasmic inclusion. A carbohydrate would probably do either or both. One should be cautioned to use a sufficient amount of the iodine solution and especially to use a freshly diluted liquid which has been made from a stock iodine solution that is not too old.

D. Amyloid, which may give a color reaction with Lugol's solution not unlike some of the polysaccharides, is not soluble in normal saline or tap water.⁷

E. If the fixed smears containing epithelial-cell inclusions showing the iodine color reactions are treated with concentrated sulphuric or hydrochloric acid, the only change is one of rather rapid fading of the reddish-brown color, and often the color disappears entirely within five minutes. This is better demonstrated in thin smears. Amyloid under such procedure would usually manifest an intensification of the iodine color reaction or a series of color changes, certainly not disappearance of the color altogether.⁸

F. The simplest and quickest method of removing the color-reacting substance from the cytoplasmic inclusion *if the smear has been fixed by heat*, is by dropping a small amount of saliva on the smear. The color-reacting substance will often disappear within an hour, as shown by the failure of the color to reappear when the preparation is again treated with the iodine solution after the saliva has been washed off. The smear should be thin to demonstrate this.⁵

G. A more conclusive test showing the action of the saliva was carried out as follows:

Two slides designated "A" and "B" were both fixed in 95-percent alcohol and then stained with the iodine-potassium-iodide solution. Cells were located on each slide which showed the iodine-color-reacting inclusions. The slides were then processed as follows:

Slide A.

Lugol's stain. Color inclusions found present.

Three hours in saliva (diluted 1:8 with normal saline) in a Coplin jar, in incubator at 38°C.

Lugol's stain. Color inclusions disappeared.

Outlines distinguishable but reddish-brown color absent. Granules visible in inclusion but not staining.

Slide B.

Lugol's stain. Color inclusions found present.

Three hours in boiled saliva (diluted 1:8 with normal saline) in incubator at 38°C.

Lugol's stain. Color inclusions present.

Three hours in unboiled saliva. Lugol's stain. Color inclusions disappeared.

The only difference in treatment of the two slides was that Slide A was treated with normal saliva while Slide B at first was treated with saliva which had been boiled. The boiling, of course, had destroyed the effectiveness of the ptyalin. The color-reacting substance of the inclusion was undoubtedly digested by ptyalin.

Immersion of heat-fixed smears in distilled water for 100 hours has not caused the disappearance of the iodine-color-reacting substance. Smears fixed in 95-percent alcohol, such as the aforementioned smears treated with saliva, have been left in distilled water 224 hours without undergoing the loss of the color-reacting substance.

Smears that have been fixed in alcohol require a longer time in the diluted saliva solution than do those fixed by heat.

H. If normal saline that has been made distinctly alkaline to neutral red with ammonium hydroxide, is passed under the cover slips of one of the wet preparations having the inclusions stained with the weak iodine solution, the color reaction will disappear entirely. A solution of glycogen in a test tube that has had iodine added to it will lose its port-wine color when made alkaline with ammonia water.⁶

I. If the weak iodine solution has a small amount of hydrochloric acid added to it so that it becomes acid to litmus, the epithelial-cell inclusions in the wet preparation will hold the reddish-brown color many days. This is true of the glycogen color reaction with iodine in the test tube when hydrochloric acid is added even in the presence of ptyalin.

J. The inclusions are stained different degrees of red when using Best's carmine stain. Some of the inclusions

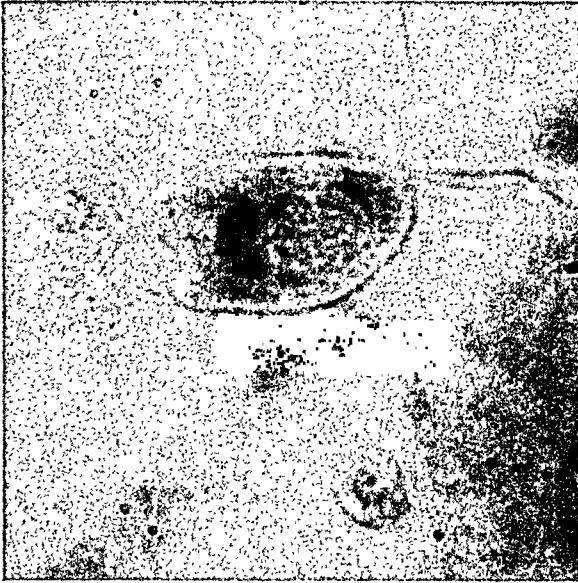


Fig. 1

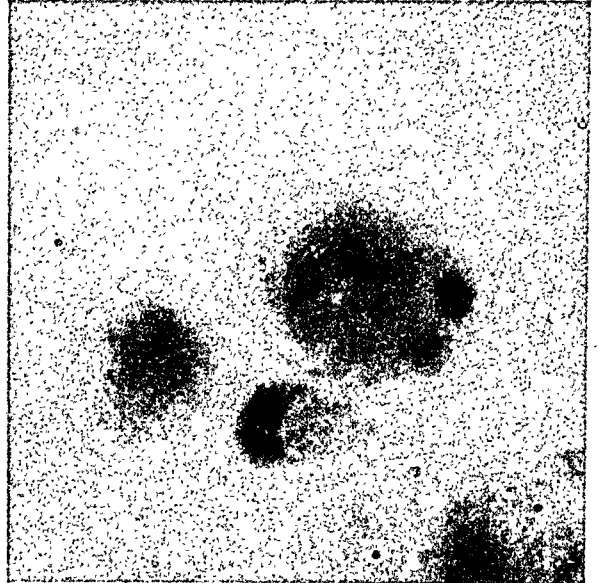


Fig. 2

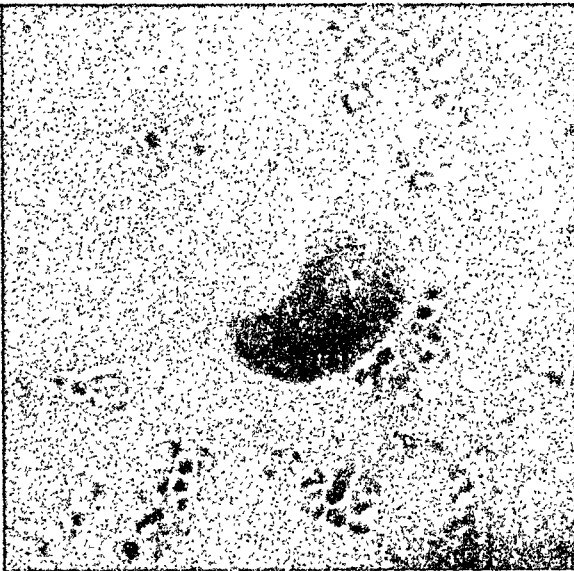


Fig. 3

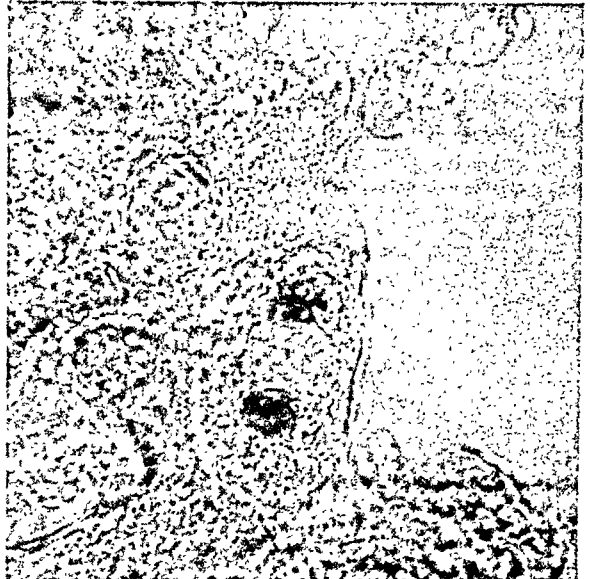


Fig. 4

Fig. 1 (Rice). Epithelial cell, fixed, stained with the weak iodine-potassium-iodide solution. C. filter used. Magnification $\times 1000$.

Fig. 2 (Rice). Two epithelial cells with the red-brown inclusions. Fixed cells. C. filter. Magnification $\times 1000$.

Fig. 3 (Rice). Large iodine-color-reacting inclusion. Cell outline practically filtered out. Magnification $\times 1000$.

Fig. 4 (Rice). Wet preparation—very weak iodine solution. Large epithelial cell with nuclear outline visible and iodine-color-reacting inclusion at each pole of nucleus. C. filter. Magnification $\times 1000$.

may not stain with the carmine just as some stain very faintly with the iodine.⁹

Are these iodine-color-reacting inclusions identical with the v. Prowazek-Halberstaedter inclusions found in the conjunctival epithelial cells in tra-

choma? The iodine-color-reacting inclusions are probably identical with the inclusion bodies of v. Prowazek-Halberstaedter¹ as they were not found in the conjunctival epithelial cells except in cases that showed the typical v.

Prowazek-Halberstaedter inclusions as brought out by the Giemsa stain. These carbohydrate inclusions show in the fixed cell the same formation and arrangement around the nucleus as do the v. Prowazek-Halberstaedter inclusions stained with Giemsa. (See Figures 1 and 2.)

It is easy to identify the same inclusion bodies by locating one or more of the carbohydrate inclusions stained with the iodine-potassium-iodide solution, decolorizing in tap or distilled water for as long as it takes to remove the reddish-brown color in the inclusions, usually not more than one hour, and then staining with the usual Giemsa stain. There is illustrated in figure 5 an epithelial cell treated in this way. With the stronger iodine solution, the inclusions in this cell showed the deep, uniform reddish-brown color reaction. After one hour in distilled water this reddish-brown color had entirely disappeared. The illustration shows the cell stained with Giemsa.

Further observations on the carbohydrate inclusions in the unfixed epithelial cells of the trachomatous conjunctiva. In order to throw further light on the nature of the carbohydrate inclusions, unfixed cells, from cases known to show numerous inclusion bodies, were placed in varying strengths of brilliant cresyl blue, covered with thin slips, and ringed with melted vaseline. The inclusions were stained remarkably well in the unfixed cell by this stain and photographed well in the wet preparation, as is illustrated in figure 6. There is well shown the sharp line of demarcation the inclusion body gives with the cytoplasmic substance in a cell undistorted by fixation.

A very effective method of demonstrating the inclusions with a vital stain is by using neutral red (1:2,000). By this method an epithelial cell may show no staining of the cytoplasm and very faint staining of the nucleus, but the inclusion will stand out a bright red. The granular nature of the inclusion is especially well shown by the neutral red as well as the sharp line of demarcation separating the inclusion body

from the cytoplasm. These granules are undoubtedly the "elementary bodies" of von Prowazek and the "initial bodies" of Lindner.^{1, 10}

As stated above, the iodine color reaction in the unfixed cells in the wet preparations stained with the very weak iodine solution, usually disappears entirely within 12 to 18 hours. When the iodine color reaction is at its height the inclusion usually appears as a deeply colored body with a sharp line of demarcation separating the body from the cytoplasm. It appears, therefore, that the carbohydrate inclusions may have a limiting membrane. Some of the inclusions may contain less of the carbohydrate matrix than others. These inclusions will stain more faintly and granular bodies will show through the stain, so that the homogeneous appearance shown by the more densely staining inclusions is not apparent. When the iodine color reaction has disappeared, the inclusion may still be easily identified, as the area of the inclusion in some cells will appear much less dense than the remaining portions of the cell. This is especially noticeable if the 4-mm. objective of the microscope is used. The inclusions lose their homogeneous appearance in the unfixed cell after the disappearance of the iodine color reaction and appear to be crowded to different degrees with distinct granular bodies too small to be photographed but distinctly visible under the oil-immersion lens. Figure 7 shows a group of unfixed cells with two cells showing a large carbohydrate inclusion in each giving the iodine color reaction. These are already starting to fade. Figure 8 shows the same field 18 hours later, the iodine color reaction entirely gone but the granular appearance of the inclusions plainly evident. In another slide it could be seen that more light was coming through the inclusion-body area than through the remaining parts of the cell.

Is the carbohydrate which can be demonstrated in the von Prowazek-Halberstaedter inclusion a matrix or is it a component of the granular bodies contained within the inclusion? If the inclusions are stained with the stronger



Fig. 5

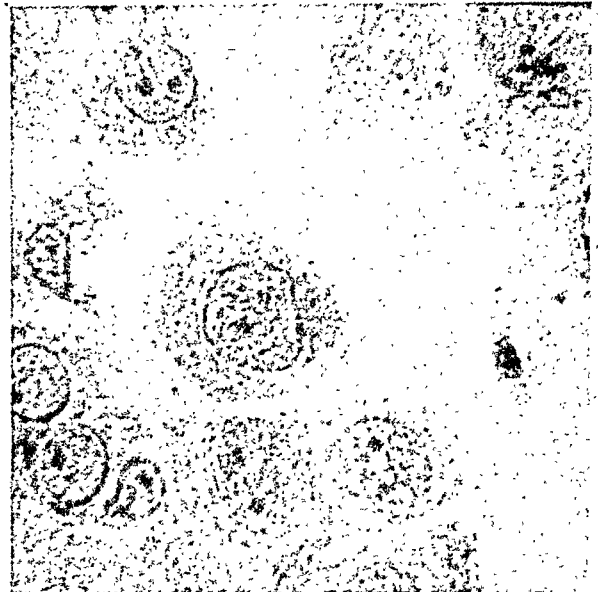


Fig. 6



Fig. 7

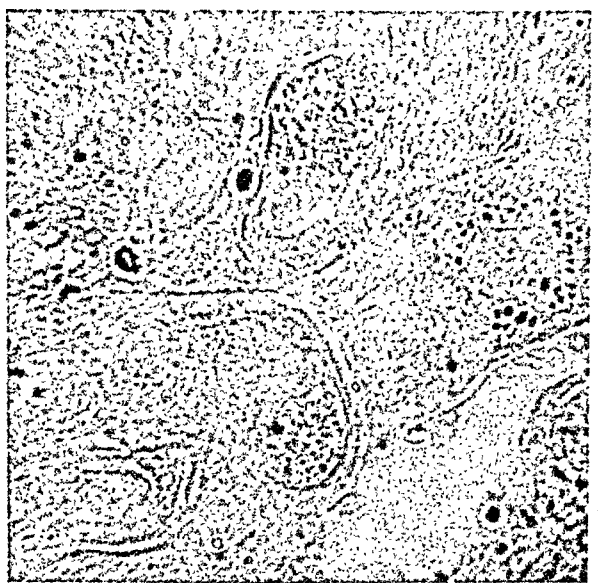


Fig. 8

Fig. 5 (Rice). Alcohol-fixed epithelial cell. Stained first with the strong iodine-potassium-iodide solution. The inclusion showed as a red-brown body. Cell then decolorized in distilled water and stained with Giemsa. The former red-brown inclusion now appeared as a v. Prowazek-Halberstaedter inclusion body of trachoma. Filter B. Magnification $\times 1000$.

Fig. 6 (Rice). Another group of unfixed epithelial cells in wet preparation stained with brilliant cresyl blue (1:200). One cell shows a typical trachoma inclusion capping the nucleus. Inclusion shows a sharp line of demarcation from cytoplasm. No filter. Magnification $\times 1000$.

Fig. 7 (Rice). Wet preparation of unfixed cells in very weak iodine solution, showing two epithelial cells with large iodine-color-reacting inclusions which are fading. No filter. Magnification $\times 1000$.

Fig. 8 (Rice). Same field as in figure 7, twelve hours later with all of iodine-color-reacting substance dissipated from cell inclusions. Inclusions have lost homogeneous appearance and appear distinctly granular and less dense than the rest of the cell. No filter. Magnification $\times 1000$.

iodine solutions and then studied under the oil-immersion lens many will be seen to show an almost uniformly solid staining, such as in illustration 3. After soaking such a smear in water, in order to decolorize, and then staining with Giemsa, some of these solid-staining inclusions will be found to contain comparatively few of the smaller bodies. There will be broad spaces in the inclusion unoccupied by elementary or initial bodies. This would seem to indicate that the carbohydrate is truly a matrix and stains slightly, if at all, with Giemsa. As to whether the granules definitely show this characteristic carbohydrate stain with the iodine solution, I am not prepared to say.

Summary

The use of an iodine-potassium-iodide solution for staining the fixed smears of epithelial scrapings from trachomatous conjunctivae brings out a distinct epithelial-cell inclusion that seems to contain a very appreciable amount of a carbohydrate that reacts with iodine in a manner characteristic of some of the polysaccharides. This polysaccharide is thought to be glycogen. Saliva is highly suitable for quickly proving that the iodine-color-reacting substance in the inclusion is acted upon by the enzyme of the saliva. Study of the epithelial cells in wet unfixed preparations show a cytoplasmic inclusion as sharply demarcated as the nucleus of the cell.

Evidently the disappearance of the iodine-color-reacting substance in the epithelial cell is dependent very much on the reaction of the menstruum in which the scraping from the lid is placed. This reaction may be greatly affected by the solution with which the conjunctival sac is irrigated prior to scraping. The disappearance of the iodine-color-reacting substance is hastened by having the menstruum very slightly alkaline.

It has been found best in studying the appearance of the carbohydrate inclusions under Giemsa, to stain the fixed smears first with the iodine solution, then to decolorize with water before passing the slide through the

Giemsa technique. To stain first with Giemsa is not so satisfactory, as all traces of the Giemsa stain in some of the inclusions are difficult to remove.

Glycogen is readily soluble in water to a certain extent, and because of this iodine is considered unsuitable for demonstrating glycogen in fresh tissue.⁷ In the case of the glycogen that seems to be massed in the v. Prowazek-Halberstaedter inclusion, it is readily demonstrated in the unfixed cytoplasmic inclusion for several hours and, by making the iodine solution acid to litmus, the glycogen may be demonstrated in the fresh tissue for days. This glycogen can thus be restrained from becoming diffused throughout the cell, indicating the possibility of a limiting membrane. The fact that acidulation will keep the glycogen unchanged for days may simply mean the stopping of an enzyme activity, just as the activity of ptyalin may be stopped by the addition of hydrochloric acid.¹¹

The carbohydrate that exists in considerable amounts in the trachoma inclusion can be demonstrated in the smaller inclusions in the initial-body stage and in the inclusions that occupy the whole of the cytoplasmic body.

This carbohydrate is apparently a true matrix in which are embedded or suspended the smaller formed elements known as initial bodies and elementary bodies. It is not the plastin which is often referred to in the literature, as it apparently takes little and usually none of the Giemsa stain. This is especially noticeable in those inclusions of medium size, containing mostly initial bodies, which happen to show considerable spacing between the small bodies. With iodine, such inclusions stain solidly but with Giemsa there is no staining between the initial bodies.

As to the origin of the carbohydrate, it may be a by-product of the special metabolism of the small granules, or it may be formed by a limiting membrane that may exist. It might be formed by the epithelial cell itself as a result of irritation from a virus present within the cell protoplasm. A special metabolism for the inclusion would seem to be indicated by the marked

difference in reaction of the inclusion and the cytoplasm to neutral red. It is of interest to note that the inclusions of inclusion-body blennorrhea show the same reactions to iodine that have been described for those of trachoma.

Conclusions

1. The v. Prowazek-Halberstaedter inclusion body in the epithelial cells of trachomatous conjunctivae contains a very appreciable amount of carbohydrate which gives a sharp color reaction with iodine. The evidence seems to indicate that this carbohydrate in the trachoma inclusion body is glycogen. This carbohydrate evidently exists in part as a matrix or diffused throughout the inclusion.

2. The v. Prowazek-Halberstaedter inclusions may, therefore, be demonstrated with a modified Lugol's solution.

3. With the weak Lugol's solution, the v. Prowazek-Halberstaedter inclusions can be more certainly demon-

strated in thick and indifferent smears than with the use of Giemsa stain. For the clinician, this iodine stain should prove a quick and simple method of examining conjunctival scrapings for inclusions.

4. It can be demonstrated that the v. Prowazek-Halberstaedter inclusions in wet preparations of unfixed cells contain varying numbers of easily visible granules, after removal of the carbohydrate matrix. These granules are in all probability the "elementary bodies" of von Prowazek and the so-called "initial bodies" of Lindner.

I wish to express my appreciation to Dr. Ida A. Bengtson, of the National Institute of Health, and Dr. L. A. Julianelle of Washington University Medical School, for many critical suggestions. I am also indebted to Associate Professor C. J. Millar of the Missouri School of Mines for the photomicrographs.

Post Office Building.

References

- ¹ Halberstaedter, L., and von Prowazek, S. Ueber Zelleinschlüsse parasitärer Natur beim Trachom. Arb. aus d. k. Gesundheitsamte, Berlin, 1907, v. 26, pp. 44-47.
- ² Stewart, F. H. Seventh Annual Report, Giza Memorial Ophthalmic Laboratory, Cairo, 1933.
- Williams, A. W., and others. A study of trachoma and allied conditions in the public school children of New York City. New York City Department of Health, Collected studies, 1912-13, v. 7, pp. 203-207.
- ³ Thygeson, P. Arch. of Ophth., 1934, v. 12, Sept., pp. 307-318.
- ⁴ Bodansky, M. Introduction to physiological chemistry. Ed. 2, New York, 1930, pp. 61-62.
- ⁵ Mathews, A. P. Physiological chemistry. Ed. 5, New York, 1930, p. 817.
- ⁶ Koch, F. C. Practical methods in biochemistry. Baltimore, 1934, p. 20.
- ⁷ Mallory, F. B., and Wright, J. H. Pathological technique. Ed. 7, Philadelphia and London, 1918, p. 177.
- ⁸ ———. Ibid., p. 180.
- ⁹ ———. Ibid., p. 68.
- ¹⁰ Lindner, K. Die freie Initialform der Prowazekschen Einschlüsse Wien. klin. Wchnschr., 1909, v. 22, p. 1697.
- ¹¹ Hawk, P. B. Practical physiological chemistry. Ed. 4, Philadelphia, 1914, pp. 61-62.

SYMPATHETIC OPHTHALMIA

Part I

ALAN C. WOODS, M.D.
BALTIMORE

This paper, which is a lecture given (by invitation) at the Postgraduate Course in Ophthalmology at the University of Rochester in New York, covers the important observations and views on this much-discussed subject. In it the author compares the data derived from the reports on this subject by Fuchs, Joy, and Verhoeff, and adds his own observations on twenty-eight cases, in fifteen of which the diagnosis was confirmed by histological study.

It will appear in two parts. In the first part are treated the history, definition, and incidence of the disease; its predisposing causes and the clinical picture in the exciting eye, the interval between injury of the exciting eye and onset of the disease, the clinical picture in the sympathizing eye, and the duration of the disease.

Causes other than penetrating wounds have induced the disease in seven authenticated cases observed by the writers whose data are tabulated for comparative purposes, among them one of his own. The type of trauma which the author regards as most grave in threatening sympathetic ophthalmia is the penetrating wound that involves the root of the iris or the ciliary region. The interval between injury to the exciting eye and onset of the disease in approximately 64 percent of the 129 cases discussed was under two months, and it appears that after three months have elapsed the chances for its development rapidly decline. However, assuming that no second injury has affected the exciting eye, it must be considered that long-delayed sympathetic ophthalmia is a clear-cut clinical entity. There is nothing characteristic in the exciting eye to point to a threatening of the second eye. In the author's opinion the salient characteristic clinically in the sympathizing eye is the massiveness and rather intermittent progress of cellular reaction in contrast to the low intensity of vascular and inflammatory reaction. From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

History

The first mention of possible sympathetic ophthalmia is in the anthology compiled by Constantius Cephalis, A.D. 1000, where in a quotation from Agathias, volume 11, page 352, is this observation: "The right eye when diseased often gives its suffering to the left." In 1583, Georges Bartisch, speaking of painful phthisis bulbi after injuries said, "In this case the other eye is in great danger." Throughout the next 300 years only occasional mention is made of the disease. In 1840 MacKenzie, in the third edition of his "Treatise on diseases of the eye," gave the first accurate description of the disease, and likewise gave to it the name it bears today. He regarded penetrating wounds of the eye, especially those involving the ciliary body, as the chief cause.

Definition

Sympathetic ophthalmia is a specific bilateral ocular disease, which usually occurs after penetrating wounds that involve the uveal tract of one eye, although rarely it may follow other causes. The injured eye is known as the exciting eye, and the uninjured eye as the sympathizing eye. The disease ap-

pears in the exciting eye at a variable time after injury and, synchronously or shortly afterwards, affects the sympathizing eye. The disease is confined primarily to the uveal tract. The clinical picture is fairly characteristic and the histologic picture is quite characteristic.

In defining the term "sympathetic ophthalmia," we should differentiate it sharply from "sympathetic irritation." This latter term is used to describe what is apparently a reflex disturbance in the second eye, after disease or injury of the first eye. This reflex disturbance is characterized by slight photophobia, lacrimation, and often transient amblyopia. Sympathetic irritation is rarely, if ever, the precursor of sympathetic ophthalmia.

Incidence of sympathetic ophthalmia

The older statistics on the incidence of sympathetic ophthalmia after injury, and the age and sex incidence are somewhat unreliable. A survey of the cases reported in the literature shows at once that many of the cases are probably not true sympathetic ophthalmia. Sufficient cases do not occur in any one clinic to afford statistical study, and it is diffi-

cult to draw conclusions from composite figures derived from many clinics, where individual differences in viewpoint influence the diagnosis.

As regards the general incidence of the disease, the only figures of value are those of Schirmer and Ohlemann and Theobald. These authors place the general incidence as 0.15 percent of all eye diseases. Of much greater clinical importance is the probability of the occurrence of sympathetic ophthalmia after penetrating wounds of the eye. Here the figures vary from a minimum incidence of 0.54 percent to a maximum of 5 percent.

Somewhat more accurate figures are

Table 1 shows the age and sex incidence in these 136 cases. While it is generally supposed that young individuals are unusually susceptible to the disease, these figures, when compared with the age incidence of the general population, do not confirm this belief. While 34 percent of these cases occurred in individuals under 20 years of age, the age incidence of population under 20 years is 37 percent. It does appear to be more common in persons over 50 years of age, 28 percent of the cases occurring in this age group, while the age incidence of population in this group is only 17.3 percent. However, this is not conclusive, for individuals in

Table 1

AGE AND SEX INCIDENCE

Authors	0-11 yrs.	11-20 yrs.	21-30 yrs.	31-40 yrs.	41-50 yrs.	51-60 yrs.	61+ yrs.	Male	Fe- male
Fuchs	4	5	6	5	3	5	5	26	9
Joy	7	3	9	3	3	7	8	28	12
Verhoeff	8	3	2	6	7	4	5	?	?
Woods	9	7	5	1	2	2	2	18	10
Total	28	18	22	15	15	18	20	72	31
Percentage	20.6	13.3	16.1	11.0	11.0	13.3	14.7		
Percentage of age incidence in the population	21.0	17.0	17.6	14.8	12.3	8.8	8.5		

Figure not available—Fuchs 2; Joy 1.

available on the incidence with respect to age and sex, the nature of the injury in the exciting eye, the interval between injury and onset of the sympathetic disease, and other significant data. Fuchs lists 35 proved cases in which accurate statistics are available. H. H. Joy has recently made an excellent statistical study of the cases of sympathetic ophthalmia occurring in New York State in the last 25 years. All in all, he has collected 41 cases of the disease, the diagnosis of which has been proved by histological study. Verhoeff^a has reported 35 cases in which accurate statistics are given. To these the author is able to add 28 cases, all personally observed, of undoubted sympathetic ophthalmia, the diagnosis in 15 cases having been confirmed by histological examination of the exciting eye.

the older group are more subject to operative wounds of the eye, and probably less subject to accidental wounds, the chief cause of sympathetic ophthalmia. Similarly, younger individuals are probably more subject to accidental wounds. Further, these figures indicate that males are over twice as susceptible as females, but again males would be more exposed to accidental and industrial injuries of the eyes. To determine accurately the age and sex susceptibility to sympathetic ophthalmia, we would require accurate statistics on the occurrence of accidental ocular wounds and intraocular operations in relation to age and sex. Such statistics are not available, and it does not seem justifiable, therefore, to assume from these figures that there is any especial age or sex susceptibility.

Predisposing causes in exciting eye

In his classical description of sympathetic ophthalmia published in 1840, MacKenzie emphasized that the pre-eminent cause of the disease is penetrating wounds of the eye involving the root of the iris and the ciliary body. The reports of Randolph, Schirmer, and of other writers on the disease have abundantly borne out the accuracy of this observation. Unfortunately, as before mentioned, the older statistics are somewhat unreliable, due to the questionable diagnosis of many of the cases listed. A study of the 139 cases of Fuchs, Joy, Verhoeff,⁸ and Woods, however, seems to reflect fairly well the generally reported incidence of predisposing causes (table 2).

pathetic ophthalmia following subconjunctival scleral rupture, there are three undoubted cases listed in table 2, while the four cases collected by Joy are listed as due to nonpenetrating contusions, and scattered similar cases have been reported by other observers. Likewise a number of cases of sympathetic ophthalmia have been reported following disintegrating intraocular tumor. Schirmer has collected 30 such cases; these Gifford has analyzed, admitting that eight of them are probably instances of true sympathetic ophthalmia. To these Fuchs has added three cases and Meller, one. The importance of these two predisposing causes will be stressed when we discuss the pathogenesis of the disease.

Table 2

PREDISPOSING CAUSES IN EXCITING EYE

Predisposing Cause	Fuchs	Joy	Verhoeff	Woods	Total	Percentage
Penetrating wounds	19	26	20	23	88	63.3
Cataract operations	4	5	7	2	18	12.9
Other intraocular operations	4	3	7	1	15	11.0
Subconjunctival, scleral rupture; non-perforating contusions (Joy)	2	4		1	7	5.0
Perforating corneal ulcers	3	1	1	1	6	4.2
Phthisis bulbi—after measles	0	1		0	1	0.7
Intraocular tumor	3	1		0	4	3.0

In this collected series, penetrating wounds of the exciting eye were the predisposing cause in 63.3 percent of the total number of cases. Intraocular operation was the exciting cause in 23.9 percent of the total number. Joy has called attention to the violence of the sympathetic inflammation after cataract extraction. This holds true in one of the two cases in the author's series. Fuchs reported that in three of his four cases that followed cataract extraction, the course was severe, and in the fourth case moderately severe.

Of especial interest are the cases of sympathetic ophthalmia following nonpenetrating wounds of the eye, such as simple contusion, subconjunctival scleral rupture, and disintegrating intraocular tumor. Harold Gifford has reported two undoubted cases of sym-

It has long been a point of common observation that sympathetic ophthalmia rarely, if ever, occurs when the injury in the first eye has been complicated by a purulent infection or panophthalmitis. So strongly was this belief held that for years, in the pre-Lister days, it was a common therapeutic procedure to induce suppuration in the lost, injured eyes as a prophylaxis against sympathetic ophthalmia. The early German investigators believed that the purulent infection destroyed the specific organisms which they believed to be responsible for sympathetic ophthalmia. H. Gifford believed that blockage of the lymph channels in the injured eye by the masses of leucocytes prevented the spread of the disease to the fellow eye. However, while this protection against sympathetic oph-

ththalmia by suppuration in the injured eye is generally true, it is not absolute. Schirmer has reported two cases of sympathetic ophthalmia that followed injury and panophthalmitis in the exciting eye, and the author has seen one similar case.

Clinical picture in the exciting eye

Primarily, it must be emphasized that it is impossible to tell accurately from the examination of the exciting eye whether sympathetic ophthalmia threatens the second eye. While both the exciting and the sympathizing eyes show histologically an identical fundamental pathological process, the fairly characteristic picture in the exciting eye may be masked by the traumatic cyclitis. Clinical observation has taught us that wounds of the cornea, even when complicated by anterior synechiae, rarely, if ever, lead to sympathetic disease, and that purulent infection of the injured eye tends to protect the second eye.

There is one type of eye that is most to be feared as an exciting eye in the production of sympathetic ophthalmia. This is the eye that has suffered a penetrating wound involving the root of the iris or the ciliary region, in which there ensues a long-drawn-out, indolent uveitis with occasional exacerbations. Especially to be feared are such eyes with a tendency to phthisis bulbi, and recurrent ciliary pain. The persistence or recurrence of low-grade ciliary congestion, thickening and cellular infiltration of the iris, gradual formation of occlusio pupillae, and capsular clouding of the lens make up the usual clinical picture of sympathetic ophthalmia in the exciting eye. Yet the disease in the sympathizing eye may follow fast on a violent, acute, traumatic uveitis in the exciting eye. While we fear the indolent, recurrent, traumatic uveitis, with a tendency to phthisis, more than any other condition as a predisposing cause of sympathetic ophthalmia, nevertheless, it must be emphasized that there is nothing characteristic in the picture in the exciting eye, and that sympathetic ophthalmia may occur following

a penetrating wound that is apparently healing without complications.

Interval between injury to exciting eye and onset of sympathetic ophthalmia

The interval between injury to the exciting eye and the onset of sympathetic ophthalmia in the second eye is extremely variable. The Nettleship report of 1886 gives the shortest interval as nine days and the longest interval as 20 years. Schirmer reports that in the cases collected by him the minimum interval between injury and onset of sympathetic ophthalmia was 14 days and the maximum interval 42 years. Randolph agrees with Schirmer that 14 days is the minimum interval reported in an undoubted case, and gives the maximum reported interval as 47 years. In many of these long-delayed cases the diagnosis is not certain, since frequently it has not been proved by histological examination of the enucleated eye. In the cases of Fuchs, Joy, Verhoeff,^a and the author, charted in table 3, there are 13 cases of undoubted sympathetic ophthalmia in which the apparent interval between injury and the outbreak of the disease was over one year. If we can assume that there has been no second injury of the exciting eye, it would appear that long-delayed sympathetic ophthalmia is a clear-cut clinical entity (table 3).

In his series, Joy reported one case with a minimum interval of nine days, in the series of Verhoeff^a and the author the shortest interval observed between injury and onset was 14 days, and the shortest interval reported by Fuchs was three weeks. Joy reported seven cases with the interval over five years, and in one case of proved sympathetic ophthalmia it was 48 years. Fuchs reported four cases in which the interval was from 9 to 20 years. I have observed only two cases in which the interval was over one year. In one of these the interval was 18 months, and in the other five years. In both of these patients, however, the exciting eye was not enucleated until the outbreak of the sympathetic disease.

However, it is apparent that in ap-

proximately 64 percent of the cases the interval is under two months. In Fuchs' series 73.3 percent, in Verhoeff's series 85 percent, and in Woods' series 81 percent of the patients observed showed an interval under three months. In the combined series 90 percent of the patients showed the interval between injury and onset of sympathetic ophthalmia to be less than one year. Certainly we are justified in the assumption that three months after injury, the chances of the development of sympathetic ophthalmia rapidly decline, and that the development of the disease one year after injury, while a possibility, must be regarded as a rarity.

berg believed the most characteristic finding to be small, white spots in the periphery of the fundus. Mooren, as early as 1869, emphasized and described with exceeding accuracy the characteristic rigidity of the iris tissue and the inability either to dilate the pupil or to secure a broad iridectomy by operation. He described a "felting of the uveal tract into a rigid mass." Randolph, in 1905, described as characteristic symptoms the absence of pain, the insidious onset, the early failure of vision, the small amount of inflammatory reaction in the early stages, and the tendency to exacerbation. Gifford repeated essentially the same description of the dis-

Table 3

INTERVAL BETWEEN INJURY TO EXCITING EYE AND ONSET OF SYMPATHETIC OPHTHALMIA

Interval	Author and No. of Cases				Total	Percentage
	Fuchs	Joy	Verhoeff	Woods		
9 days	0	1	0	0	1	0.8
2-3 weeks	1	0	3	1	5	3.9
3 wks.-2 months	15	16	27	21	79	61.2
2 months-1 year	10	12	5	4	31	24.0
1-48 years	4	7	0	2	13	10.1

No information—Fuchs 5, Joy 5.

Clinical picture in sympathizing eye

The tendency of the older writers on sympathetic ophthalmia was to subdivide and classify the disease according to the predominating symptoms exhibited by the various cases observed. Thus Randolph, in 1898, speaks of sympathetic plastic iritis, sympathetic serous iritis, and sympathetic papillo-retinitis almost as different clinical entities, with respectively better prognosis in the three conditions. Schirmer, in 1905, carried this classification still further, and described sympathetic fibrinous uveitis, sympathetic serous uveitis, sympathetic papillo-retinitis, sympathetic atrophy of the nerve, sympathetic cataract, sympathetic detached retina, and sympathetic conjunctivitis, keratitis, and scleritis. There is also no uniformity of opinion among the older writers as to the most characteristic manifestations of the disease. Hirsch-

berg as that given by Randolph, but apparently agrees with Hirschberg and other later authors that the most characteristic sign is the small, yellowish, yellowish-red, or white spots about one-fifth disc diameter in size, appearing towards the middle and outer periphery of the eye.

With the advance in medical knowledge, the recognition of other ocular disease entities, which earlier were doubtless confused with sympathetic ophthalmia, and especially with the revelation of the characteristic histologic picture of sympathetic ophthalmia, we are able to consolidate the various subdivisions of the disease described by the older authors, and to recognize a rather characteristic clinical appearance which coincides closely with the histologic picture.

Nevertheless, the accuracy of many of the older observations is astounding.

We would have difficulty in describing the changes in the iris better than did Mooren in 1869; and Randolph's description of the disease, when he speaks purely from his personal observations, is classically accurate.

To my mind, the salient characteristic in the clinical picture of sympathetic ophthalmia is the massiveness and rather intermittent progression of the cellular reaction in contrast to the low intensity of the vascular or inflammatory reaction. Primarily, we may recognize two different clinical manifestations of sympathetic ophthalmia, which for want of better terms may be called the anterior and posterior forms of the disease, depending on whether the anterior or posterior uvea is primarily attacked. Yet, whether the morbid process begins in the iris and ciliary body on the one hand, or in the posterior choroid with secondary changes in the retina and optic nerve on the other hand, the usual course of the disease is to spread slowly to the unaffected portions of the uvea, producing finally a nearly identical picture.

The changes in the anterior uvea are characterized by an insidious onset, the early picture being that of a low-grade iritis associated with visual failure and absence of pain. Periods of acute exacerbation of the inflammation frequently occur. The iris gradually becomes lusterless and thickened, new vessels appear, and there is early capsular clouding of the lens. Associated with this are deposits on the posterior corneal surface, and an increased cellular content of the aqueous, with a positive ray on slitlamp examination. Later in the disease, usually after two months or longer, a characteristic change appears. The pupillary margin of the thickened iris, bound down completely by posterior synechiae, appears to become confluent with the thickened and semiopaque lens capsule, and small capillaries from the iris run over the infiltration on the lens capsule and appear to invade the anterior capsule of the lens. Frequently, rather large, flat nodules develop in the thickened iris, usually in the central or inner portion. The media of the eye are usually clear

at the onset, but small opacities rapidly appear in the vitreous and then generalized vitreous turbidity occurs. There is an early subretinal edema, and the optic nerve is at first congested and red. As the lens capsule clouds, and the vitreous becomes more turbid, all the fundus details are lost. With the formation of posterior synechiae, the intraocular tension usually rises gradually and the eye passes into a secondary glaucoma of varying intensity and duration. If the disease is not controlled in this stage, or earlier, the glaucoma usually persists for a period of several months, then with the formation of a complete cataract and often seclusion of the pupil, the eye gradually passes into a lower tension and usually into phthisis bulbi.

In the posterior form of the disease the onset is radically different. While there are early disturbances of vision, there is at first an absence of iritis. The media are clear, but examination of the fundus shows a generalized subretinal edema in the posterior pole of the eye, associated with swelling and congestion of the optic nerve. The small exudates described by Hirschberg, Haab, Gifford, and others, appear towards the center of the periphery of the fundus. Frequently there are sharp changes in the refraction, in the form of a temporary hyperopia, which are probably due to the increased thickness of the choroid. The vitreous very rapidly becomes hazy, and the morbid process advances to the anterior uvea with the characteristic changes in the iris already described, and the capsular clouding of the lens. Thereafter there is little difference in the picture. In the cases of sympathetic ophthalmia where the posterior uvea was first attacked, glaucoma appeared relatively early in the disease. This is probably due to the increased protein content of the intraocular fluids, associated with an absence of congestion of the anterior ocular segments.

A straight sympathetic papillo-retinitis, without tendency to spread to the surrounding uvea, and invariably permanently relieved by enucleation of the exciting eye, is described by the older

authors. It is difficult to believe this can be an entity in sympathetic ophthalmia. It is probable these early observers confused as a sympathetic phenomenon a unilateral optic neuritis, due to some other unknown cause.

The changes in the cornea consist in posterior corneal deposits with later interstitial edema and secondary changes. However advanced they may be, they must be regarded as secondary to the underlying uveitis.

The sclera is undoubtedly involved at times in the specific process, yet clinically we see little evidence of an actual scleritis.

Duration of the disease

Sympathetic ophthalmia is essentially a chronic, long-drawn-out disease. Undoubtedly one occasionally sees definite, proved cases that run an extremely mild and short course. Fuchs recorded 2 such cases in his series. Joy reported that in 9, or 22.5 percent, of his collected cases, the course was definitely mild, and in my own series the disease in 6 of the 28 patients ran a mild course.

In spite of these mild cases, the disease must be regarded as an essentially chronic one, with a marked tendency to relapse. There are no available statistical studies on the actual duration of the disease. The patients frequently disappear from observation, with the eyes lost and the disease still active and undergoing exacerbations of inflammation. In Joy's series only 11 of the 41 patients were reported as having a duration of less than three months. An analysis of the healed cases reported by

Verhoeff shows that the average duration of the disease in 27 such patients was a little over ten months, taking into account the influence of treatment. A similar analysis of the 12 healed cases in the author's series showed the average duration of the disease to be nine months, irrespective of the time of institution of treatment. The duration of the inflammation in the cases that progress to blindness must be estimated as well over one year.

The disease is characterized by short periods of remission of the acute inflammation and sharp exacerbations. Verhoeff reports as many as eight exacerbations over a period of observation of eight years, the patient still being under treatment with the maintenance of excellent vision. He reports a second case with three exacerbations in one year.

The clinical picture, therefore, may be summarized as follows: The onset is insidious, visual failure is early, and either the anterior or posterior uvea may be involved first, usually the former. The disease is long drawn out and subject to repeated exacerbations. The entire uvea is soon involved, the iris becoming greatly thickened, the pupil immobile and intractable to mydriatics. Nodules may form on the iris. Posterior synechiae are the rule, with capsular clouding of the lens and later cataract formation. The iris and lens capsule become almost confluent, with vessels from the iris invading the pupillary membrane. Secondary glaucoma occurs, which may last for months, finally subsiding, and the eye usually goes into phthisis.

(Part II will appear in the February issue.)

BULLOUS KERATITIS: A RATIONAL THERAPY

JOHN GREEN, M.D.
SAINT LOUIS

The surgical removal of Bowman's membrane in two cases of bullous keratitis permitted permanent adhesion of new-formed epithelium to the substantia propria. In one case enucleation was avoided. Thus clinical evidence tends to support Ewing's and Allen's view that the essential cause of bullous keratitis is a disease or alteration of Bowman's membrane. Read before the meeting of the American Ophthalmological Society, at Hot Springs, Virginia, June 5-7, 1935.

My interest in the subject of bullous keratitis was aroused by a perusal of Dr. Thomas D. Allen's¹ thesis "On the Pathology of Bullous Keratitis." Based on a histologic study of a large number of sections from various sources, Allen reached the conclusion that "the essential pathology of bullous keratitis is some unknown change in Bowman's membrane which interferes with its giving a foothold to the epithelium and often to the connective tissue which grows between them." Allen adds that "the treatment should be directed to the cause of the primary condition, after which, if the bullae persist in forming, the Bowman membrane in that region should be carefully removed."

The view that alteration or disease of Bowman's membrane was primarily responsible for the formation of bullae in glaucomatous eyes was advanced by Ewing² in 1904. As Allen states that Ewing's paper did not come to his attention until after he had completed his thesis, the almost identical conclusions of these authors is interesting. Should Allen's conception of this clinical entity—it can hardly be styled a disease—receive confirmation by subsequent investigators, the work of Ewing, which has been essentially ignored by subsequent writers, would have great historical interest. It seems worth while, therefore, to summarize Ewing's paper in some detail:

His patient suffered from secondary glaucoma. The anterior chamber was shallow, the iris bombé and vascular, with cholesterin crystals on its surface; the pupil was moderately dilated, the lens semitransparent. A vesicle $2\frac{1}{2} \times 3$ mm. extended from the center of the cornea downward. The globe was removed.

Histologic examination revealed the usual changes in the nerve, retina, and choroid of a degenerated glaucomatous eye. The endothelium of Descemet's membrane was absent. The posterior layers of the cornea were essentially normal; the central and anterior layers showed interlamellar spaces that were "wider than normal." Quoting Ewing, "Bowman's membrane had been destroyed in several places and filling each of these perforations besides extending variable distances between the membrane and the epithelium was a layer of thin fibrous tissue of varying width and sometimes vascular upon which rested the basal cells of the epithelium. In an area of from 3 to 4 mm. near its center the membrane was undergoing fatty degeneration as shown in the osmium stained sections." (Italics mine.) Serial sections showed that the epithelium was continuous over the whole vesicle "except for a space of about $\frac{1}{2}$ mm. near its center but in many places it was thickened and elevated from Bowman's membrane."

Again quoting Ewing, "While the cause for this form of degeneration must be attributed to lack of nourishment due to the generally diseased condition of the globe, the character of the change and its confinement to the anterior limiting membrane may explain both the formation of the vesicle and the liability to frequent relapses." He concludes as follows: "Bullous keratitis attendant upon advanced glaucoma is not primarily an affection of the epithelium but a form of necrosis of the anterior limiting membrane in the destruction of which the epithelium is forced to take part. . . . As only the anterior limiting membrane seems primarily to have been involved, it is not unreasonable to infer that a similar

condition may exist in other forms of indolent superficial keratitis, and this may explain the tardiness which accompanies the recovery from such lesions."

Probably the first recorded case of bullous keratitis (as stated by Allen) is contained in the appendix of a book of lectures by Bowman at Moorfield's Hospital in 1847-9. It occurred in a patient suffering from absolute glaucoma. The description is perfectly characteristic of the clinical picture of bullous keratitis. Bowman adds, "This affection seems a consequence of general impairment of nutrition of the organ and not of any inflammation in the cornea which is quite transparent." It is a tribute to the keen clinical acumen of Bowman that he regarded this affection as an incident in the later stages of some ocular disease characterized by degenerative changes, a view which has, in the main, been confirmed by subsequent observers.

A picture of the changes in the cornea would be a composite of the findings of the relatively few investigators who have interested themselves in this subject. It should be recalled that no example of the milder forms of the malady has been studied histologically for the very obvious reason that such eyes do not require removal. In an eye in which the bulla is but an incident in the general disorganization of the globe, it is not possible to be dogmatic with reference to the relation of certain changes to the underlying condition or to the corneal manifestation.

Endothelium membrane. The endothelium has been found considerably altered. The cells are flattened and farther apart. Sometimes, according to de Schweinitz and Shumway³ "spaces the width of the cells intervene in places between adjoining cells." Ewing found the endothelium absent.

Substantia propria. The corneal lamellae are often separated, and are sometimes distorted and irregular. Capillaries have been found in the middle layers. The corneal corpuscles are flattened and stain poorly. A connective-

tissue infiltration has been noted in some cases.

Bowman's membrane. The normal passages have been found enlarged, thus permitting penetration of epithelial cells. The membrane has been found split, with cells occupying the clefts. Other specimens show deep concavities with cells lying in the hollows. Frequently there are gaps in which the membrane is entirely absent. Fatty degeneration has been demonstrated by Ewing.

Epithelium. In the early stages there is a shrinkage of the basal cells with the appearance of an intercellular bridge work which may extend to a "foot-plate" (Allen) which lies on Bowman's membrane. Later there occurs intercellular edema, the nuclei being surrounded with vacuoles. Connective-tissue cells are sometimes found between Bowman's membrane and the epithelium.

De Schweinitz and Shumway noted especially changes in the shape of the basal cells; the normal columnar cells being replaced by distorted polygonal cells, and were inclined to think that these misshapen cells could not gain a foothold on the membrane. They observed also the interposition of a homogeneous Bowmanlike membrane between the epithelial layers—an appearance noted by nearly all investigators.

The term "bullous keratitis" should be confined to cases in which the bulla or bullae form a fluid-containing sac which may be altered in shape by pressure, and should not be applied to the minute vesicles which occur, for instance, in herpetic keratitis. Histologically, also, there are points of difference.

Whence comes the fluid in the vesicle? Is it aqueous which has been forced by increased intraocular pressure through the altered or diseased endothelium of Descemet's membrane to waterlog the substantia propria, and thence by way of the widened canals in Bowman's membrane to occupy the space beneath the epithelial sheet? It is an accepted fact that the normal

membrane of Descemet is impermeable to fluids, so that the foregoing theory would have to be rejected in explanation of bullous formations in eyes that are not glaucomatous and give no evidence of disease of Descemet's membrane.

In Allen's opinion "the cause of formation of vesicles is an unsolved problem. Evidently it is a physico-chemical change bound up in the metabolism of the cells themselves."

The drawings and photomicrographs illustrating Allen's thesis give a very complete picture of the different stages and aspects of bullous keratitis. One feature above others is strikingly exemplified in many sections; viz., that wherever Bowman's membrane has wholly disappeared the epithelium implants itself upon the substantia propria and adheres with as much, if not greater, tenacity than it did to normal Bowman's membrane. When new-formed connective tissue is formed above Bowman's membrane a firm adhesion takes place between it and the epithelium.

This feature is frequently found in the drawings of sections of other investigators, but no particular stress has been laid upon it, either as illustrating the important role of Bowman's membrane in the formation of the bulla, or as a finding suggestive of a rational therapeutic procedure. It is to Allen's credit that he deduced from the pathologic picture a practical method of dealing with many cases of this intractable malady.

That there may be a type of bullous keratitis amenable to indirect methods of treatment is suggested by three cases reported by Griscom⁴. In two of his patients there were no glaucomatous symptoms, and the bullae promptly and permanently disappeared following evacuation of pus from the nasal sinuses. In each the sinus on the side corresponding to the affected eye was involved. In his third case there was an elevation of tension, and, despite vigorous treatment with tincture of iodine and the cautery, bullae continued to form. Even iridectomy did not give relief. Treatment of a purulent ethmoiditis effected a permanent cure.

Reports of direct treatment of bullous keratitis are infrequent. Methods which have proved successful have led the authors to congratulate themselves and to put their cases on record. In most of these successful cases, either the actual cautery or a strong chemical caustic has been used. In Arnold Knapp's⁵ case, the removal of the wall of the bleb together with nearly all of the loosened corneal epithelium and the application of one-percent silver nitrate did not, primarily, effect a cure. Repetition of the treatment three weeks later led to superficial infiltration of the cornea in the upper half and finally to permanent healing. It is clear from Knapp's description that no attempt was made to remove Bowman's membrane. It is suggested that the failure to heal after the first application of silver nitrate was due to insufficient cauterization but that the second application was more vigorous and resulted in the destruction of Bowman's membrane, thus permitting the newly formed epithelium to adhere to the upper layers of the substantia propria.

An early reference to the treatment of bullous keratitis is that by W. R. Parker⁶. His patient had a bullous keratitis following a scratch of the cornea. Excision of the bleb was followed by reformation. After the galvanocautery was lightly applied there was a return of pain and bleb formation. A second application of the cautery resulted in a proliferation of epithelium and cure, there being no return of the blister four months after the last cauterization. Again it is suggested that the reason for cure was the final destruction of Bowman's membrane.

W. T. Davis⁷ has recently reported the cure of an inveterate bilateral bullous keratitis by means of frequent applications of the X ray.

Bullous keratitis, as stated above, is usually an incident in the course of degenerative disease of the globe. It frequently occurs in a totally blind eye or in an eye tending inevitably to blindness. It is not surprising, therefore, that ophthalmologists have been little interested in any means of therapy directed solely toward eradicating the

bullae and possibly preventing its recurrence. Many of these eyes, painful from an old iridocyclitis which may have eventuated in secondary glaucoma, seem to demand removal. Any less radical measure may appear to be a waste of time, and both ophthalmologist and patient may not have the patience to submit to a long course of treatment which will not restore vision. Thus the Gordian knot is cut, and the eye removed.

Case Reports

Case 1. L. H., male, aged 19 years, came under observation July 29, 1932. He stated that eight years previously his right eye had been struck by "a glancing bullet." The accident occurred while he was in a shooting gallery. Later a cataract developed. The eye, though sightless, had given no trouble until recently when it became very painful.

X ray showed the presence of a foreign body about $2 \times 1 \times 1$ mm. located 2 mm. above the horizontal plane of the cornea, 3 mm. to the temporal side of the vertical plane of the cornea, and 7.5 mm. behind the center of the cornea. Application of the magnet produced no pain reaction, so it was assumed that the fragment was non-magnetic. Vision was light perception with good projection. There were dense cataract and some synechiae. A large bleb occupied the lower third of the cornea. This was punctured with a hypodermic needle, followed by the application of an ointment containing epinephrine and holocaine. Later a salve containing hyoscine and holocaine was used. The eye was bandaged. Two weeks later the eye was white and the corneal surface did not take the fluorescein stain. Three weeks later two bullae close together appeared at the site of the former single bulla. The same treatment was followed by apparent recovery. A month later the cataract was removed by Barkan's technique. The operation was difficult, requiring the introduction of scissors into the anterior chamber to divide several firm bands of adhesion. Recovery was satisfactory, and vision with +10 D. sph. was improved to 6/50.

Six weeks after the operation, two bullae appeared, accompanied by pain. The patient was readmitted to the hospital and a corneal dissection of the entire area involved in the bullae was performed. The defect was promptly covered by epithelium. The patient was seen at intervals for six months and there was no return of the bullae.

Case 2. O. H. K., male, was seen in 1909, at the age of 47 years. Always nearsighted, he had observed failing of vision in the right eye seven months before. There was a history of injury (snowball) to the right eye in boyhood.

O.D. dense cataract. Projection good.

O.S. faint diffuse posterior capsular haze; tiny radii of opacity at lower pole of lens. Pigmentary changes at the macula.

O.S. —13 D. sph. \approx —4 D. cyl. axis 15° , V = 6/12.

In 1910 the right lens was extracted (extra capsular) after preliminary iridectomy. After discission, O.D.V. = 6/16 with +1.5 D. sph. \approx +1.5 D. cyl. axis 20° .

In July, 1932 (twenty-two years later), the patient reappeared. Three weeks previously while stooping down he had struck his left eye against the corner of a desk. There was little pain at the time but vision was much diminished. (There had been some visual failure in this eye prior to the accident.) Pain, increasing in severity, had been present for two days. There was intense ciliary congestion, the cornea was steamy, the chamber deep, the iris tremulous, the lens cataractous. V = p.1; tension, 47 (Schiötz). Two instillations of suprarenin bitartrate 1 percent increased the tension to 65 (Schiötz).

The patient was admitted to the hospital. His physician stated that he had had a chronic nephritis and diabetes for several years. Under eserine and pilocarpine drops and hot packs the eye rapidly quieted, and on discharge four days later, the tension had dropped to $16\frac{1}{2}$ (Schiötz). There was no increase in vision.

The patient remained free from symptoms to February, 1934, when the left eye again became painful. He did

not consult me until March 4th. The condition was similar to that two years previously, and in addition there was a typical bulla occupying the pupillary space and extending downward. $V = 0$. Miotics failed to lower the tension which was 64 (Schiötz). Local treatment: pantocaine one-half percent, an ointment containing epinephrine and holocaine, and dry heat (Altherm) gave only temporary relief. The bulla ruptured spontaneously. After a month of ineffective treatment the tension remained high and a second smaller bulla had developed to the temporal side of the original one. Enucleation was suggested, but strongly objected to by both the patient and his wife. Dr. W. E. Shahan who saw the patient with me concurred in this opinion.

On April 8th, the entire area covered by the two bullae was carefully re-

moved, care being taken to carry the dissection into the superficial lamellae of the cornea. (For this purpose I found Tooke's round-ended knife very satisfactory.) The cornea was not perforated. The conjunctival sac was filled with merthiolate ointment 1/5000 and bandaged. The following day the patient expressed gratitude at the relief of pain. Improvement was continuous. By April 20th, the denuded area had been wholly covered by new-formed epithelium. The bulla did not reform despite the continuance (for a time) of high intraocular pressure. The latter finally yielded to treatment (hot packs, eserine ointment one-fourth percent, and several paracenteses), pain ceased, the eye whitened and could be held open without difficulty.

3720 Washington Avenue.

References

- ¹ Allen. Trans. Amer. Ophth. Soc., 1932, v. 30, pp. 391-419.
- ² Ewing. Amer. Jour. Ophth., 1904, v. 21, June, pp. 161-172.
- ³ de Schweinitz and Shumway. Arch. of Ophth., 1903, v. 32, pp. 257-268.
- ⁴ Griscom. Atlantic Med. Jour., 1925, v. 28, August, no. 11, pp. 740-741.
- ⁵ Knapp. Arch. of Ophth., 1926, v. 55, pp. 560-562.
- ⁶ Parker. Ophth. Rec., 1894, v. 4, July, pp. 66-68.
- ⁷ Davis. Amer. Jour. Ophth., 1934, Ser. 3, v. 17, January, no. 1, pp. 24-28.

ON THE SURGERY OF GLAUCOMA: MODE OF ACTION OF CYCLODIALYSIS

OTTO BARKAN, M.D., S. F. BOYLE, M.D., AND S. MAISLER, M.D.
SAN FRANCISCO

By means of an improved method of slitlamp microscopy of the angle of the anterior chamber in the living, the authors have studied fourteen cases of glaucoma before and after operation with cyclodialysis. They conclude that the success of this operation depends upon the establishment of a cleft or permanent communication between the anterior chamber and the suprachoroidal space. Definite surgical conclusions are drawn. Read before the Pacific Coast Oto-ophthalmological Society, at Portland, Oregon, June, 1935.

E. Fuchs's¹ observations of hypotony associated with choroidal detachment following cataract extraction suggested to Heine² the thought of similarly softening the glaucomatous eye by establishing a communication between the anterior chamber and the suprachoroidal space through surgical means. He was encouraged in his idea by the knowledge, as shown by anatomical specimens, that in absolute glaucoma, with complete obliteration of the filtration angle, the suprachoroidal space remains patent for a long time, perhaps permanently so. He hoped that as in traumatic iridodialysis the healing ciliary body or iris root usually shows no tendency to readhere, the surgically detached ciliary body would also remain detached during the healing process, and that thus a permanent communication between the anterior chamber and the suprachoroidal space would be established; or that, with the help of a miotic, at least a capillary cleft would remain which would be sufficient to permit outflow of aqueous into the suprachoroidal space.

Heine's original idea has been supported by several facts. Thus, in some cases after cyclodialysis, a flat peripheral choroidal detachment has been observed with the ophthalmoscope. It seemed questionable to him, however, whether the permanency of its action could be explained in this way. In cases of this nature that have come to anatomical examination because of failure to control tension, a reattachment of the iris root is, of course, found. But what of the many successful cases that constitute the majority? One such has been examined anatomically, that of Elschmig.³ Histological examination of

the eye, the tension of which had been permanently normalized by cyclodialysis 14 years previously, showed a free angle, patent Schlemm's canal, and a communicating cleft between the anterior chamber and the suprachoroidal space within the area of operation. On the opposite, nonoperated-on, side the angle was closed and Schlemm's canal mostly obliterated. Elschmig believes the formation of the cleft to have been the major agent in reducing the tension in this case. He does not, however, exclude reduced production of aqueous, resulting from damage to the ciliary body, as a possible factor. Moreover, he does not believe the freeing of the angle to have been a factor, because the pectinate ligament (corneoscleral trabeculum) within this region appeared so sclerosed and compressed as probably to have rendered filtration impossible. This case, then, shows that the success of the operation *may* depend upon a communication between the anterior chamber and the suprachoroidal space.

Some authors believe that the improved circulation within the iris vessels—these vessels, bent at right angles by the peripheral iris adhesions, are straightened out by the operation—affords the opportunity for increased absorption of aqueous. Filtration through the scleral scar does not come into question. Others suggest that a restitution of the filtration angle by separation of the peripheral iris adhesions from the angle wall, or scraping off the pathological endothelium in the angle with subsequent regeneration when the ciliary body heals on again is a factor. Heine regards this as a possibility but remarks that it would

be difficult to demonstrate anatomically and to disprove the presence of a capillary cleft in the region of the cyclodialysis. Other theories deal with the thought of reduced formation of aqueous through atrophy of the ciliary body following section of its nerves and vessels of supply (R. Salus,⁴ Kraus,⁵ and Meller⁶). According to E. Bunge,⁷ such a partial atrophy of the ciliary body that already shows some general atrophy, due to the glaucomatous process, cannot be accepted as proved.

We, therefore, do not as yet possess a positive anatomical explanation of the action of cyclodialysis and must still content ourselves with the discussion of theories such as the ones mentioned above.

The mode of action of cyclodialysis remains, therefore, an open question to date. The importance of arriving at the true explanation of the action of the operation is evident. Our surgical technique as well as the indications for operation and choice of case would probably be materially influenced and improved by the knowledge of what we are trying and are able to achieve.

It was with this purpose in mind that we examined the angle of the anterior chamber of a series of cyclodialyzed eyes with the Koeppe contact glass, Vogt arc slitlamp, and the binocular corneal microscope. The method which we have devised will be published in the near future.^{8, 9} For the present, let it suffice to state that with this technique a truly beautiful picture of over 40 magnifications of the whole circumference of the angle and its constituent parts can be obtained, such as has not been afforded by any of the gonioscopic methods used up to the present time.

With this method we have examined to date 14 cases of primary glaucoma in which operation by cyclodialysis had been performed. Of the 11 cases in which the operation successfully normalized tension, all showed a detached iris root and a cleft between the iris root and the scleral wall. Through this cleft or aperture one can see the scleral wall and is sometimes able to look into a cavern extending 6 mm. or more pos-

terior to the scleral spur. The farther reaches of this apparently bottomless pit are lost to view. Figure 1 depicts an example of such a case. This as well as the other figures gives a diagrammatic composite view of what is seen in different lines of regard. Figure 1 illustrates the case of Mr. L., aged 62 years, who had chronic simple glaucoma, with a preoperative tension of 58 mm. Hg. (McLean), while under the influence of three-hourly instillations of 2-percent pilocarpine. Cyclodialysis (down and out) performed three years ago had successfully normalized tension (under 30 mm., McLean) to date. The operation formed the cleft (at 5) and, as is usually the case, caused some traumatic peripheral iris adhesions (at 4) on each side of the cleft. The angle is open throughout the rest of the circumference, there having been no preoperative peripheral iris adhesions.

Of the 14 eyes, all that were successfully operated on show this characteristic picture of a surgical cyclodialysis or detachment of the iris root together with a communication between the anterior chamber and the suprachoroidal space. The three unsuccessful operations, on the contrary, all resulted in a reattachment of the iris root to the scleral wall. After a second operation in one of these cases, there was formation of a dialysis or cleft, and the tension was successfully normalized. Of the remaining two patients, one was later successfully operated on with iridencleisis and the other was not subjected to reoperation, as the tension had remained nearly normal, function had been retained to date, and the patient was adverse to further surgery. It may be mentioned, incidentally, that the site of reattachment in the unsuccessful cases was more often than not posterior to its original anatomical attachment, constituting a retroplacement of the iris root. Inasmuch as in these latter cases absence of communication between the anterior chamber and the suprachoroidal space was a constant finding, this would seem to be the reason for the failure of the operation to reduce ten-

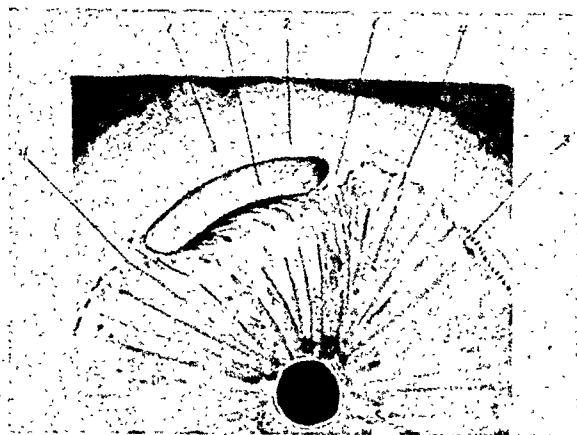


Fig. 1 (Otto Barkan, Boyle, and Maisler). Diagrammatic, composite view of the anterior-chamber angle in case 1. 1. Internal annular ring of Schwalbe. 2. Angle wall. 3. Normal insertion of iris root showing iris processes. 4. Peripheral synechiae (adhesions of iris root to angle wall as result of operation). 5. Cleft showing inner surface of sclera. 6. Piece of membrane bridging over cleft.

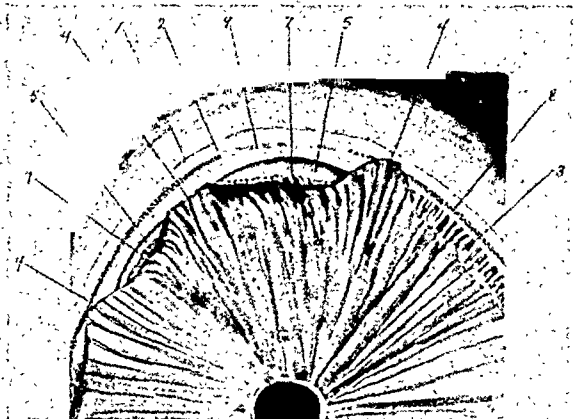


Fig. 2 (Otto Barkan, Boyle, and Maisler). Diagrammatic view of the angle following the first operation in case 2. 1. Internal annular ring of Schwalbe. 2. Angle wall. 3. Normal insertion of iris root showing iris processes. 4. Peripheral synechiae (adhesions of iris root to angle wall as result of operation). 5. Cleft showing inner surface of sclera. 7. Reattachment of iris root to sclera. 8. Pores of corneoscleral trabeculum covering Schlemm's canal stopped with pigment granules. 9. Pigment-stained Schlemm's canal exposed to view; trabecular pigment granules have been scraped off by the spatula.

sion. The following case history serves as a good example of this:

Case History

Mrs. H., aged 62 years, with a hypertension of the left eye (65 mm., Mc-

Lean) which was normalized by a cyclodialysis operation (below and out) for eight months, experienced a return of hypertension which gradually increased. Examination showed (fig. 2) the characteristic cleft or aperture between the scleral spur and iris root (at 5).

However, after prolonged examination, we discovered that in healing the iris root had become attached to the scleral wall 2 or 3 mm. behind its original anatomical insertion (at 7). The diagram represents a composite picture of what is seen at different angles of regard and shows the dialysis and the site of the reattachment of the iris root. A second cyclodialysis was performed, up and out, with an immediate reduction of tension which has persisted to date (ten months). The second cyclo-

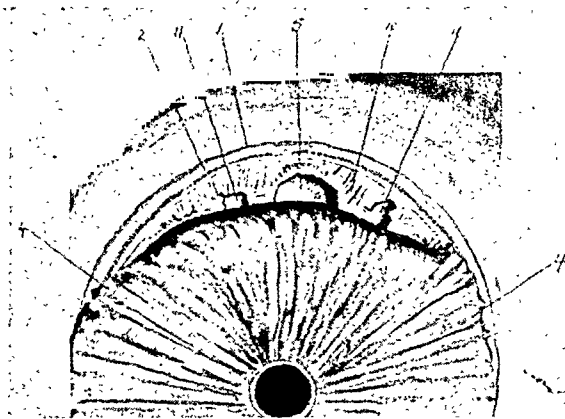


Fig. 3 (Otto Barkan, Boyle, and Maisler). View of the same eye as in figure 2 after second operation. 1. Internal annular ring of Schwalbe. 2. Angle wall (up and out). 4. Peripheral synechiae (adhesions of iris root to angle wall as result of operation). 5. Cleft showing inner surface of sclera. 10. Membrane bridging over cleft. 11. Fenestrations of membrane, permitting communication between the anterior chamber and the suprachoroidal space.

dialized region shows a characteristic cleft extending from the anterior chamber to the suprachoroidal space as illustrated in figure 3.

Here the cleft is not completely open, as in the case illustrated in figure one, but is bridged over by a very thin membrane (at 10) which, however, is incomplete, and through its fenestrations (at

11) one can see the scleral wall (at 5) and look into the suprachoroidal space, showing that there is a definite communication.

Figure 2 shows the trabeculum covering Schlemm's canal to have been scraped clean by the spatula. That this could not have been an active factor in reducing tension is proved by the recurrence of tension when the cleft closed—the rest of the picture remaining unchanged.

Surgical conclusions. In the 14 cases of primary glaucoma examined to date, tension was normalized in all those in which the characteristic surgical dialysis, as shown in figures 1 and 2, was established. In those cases, on the other hand, in which the iris had become reattached (reattachment to the original insertion or retroplacement) there was no reduction of tension, or the effect was transitory and lasted only so long as the communication remained open. The disposition to closure we have found to be due to the dialysis' being too small in extent, thus favoring adhesions of the contiguous surfaces, or to trauma during operation which creates raw surfaces and stimulates healing of the surfaces through exudation, and so forth. Thus, for instance, at the points where Descemet's membrane had been traumatized by the spatula, peripheral anterior-iris adhesions are seen to have formed, counteracting the very object of the operation. Trauma encourages exudation and formation of iris adhesions in the angle just as it induces posterior adhesions of the pupillary border of the iris to the lens, more especially in that sector of its circumference which corresponds to the sector of the iris that has been dialyzed. The tendency to exudation and formation of adhesions seems also to vary with the individual.

Successful achievement of a permanent dialysis is favored by the following factors: 1. separation of the ciliary body with the spatula through a sufficiently large portion of the circumference (two fifths to one half); 2. reduction of trauma to a minimum.

These objectives are promoted by making the scleral incision farther pos-

terior and even more diagonal than is customary, thereby facilitating entrance of the spatula in the tangential plane and also its rotation through a large arc. Perhaps, also, the rapid closure of the diagonal valvelike incision favors reestablishment of the anterior chamber and thus tends to promote the maintenance of the cleft by keeping its surfaces apart. As we believe that loss of aqueous and hemorrhage into the anterior chamber tend to encourage reattachment of the dialysis, we feel that one should attempt to preserve the anterior chamber and prevent hemorrhage. Retrobulbar injection of one cubic centimeter of novocaine with an extra drop of adrenalin, avoidance of vessels during the approach, complete hemostasis at the site of incision by means of adrenalin wicks and if necessary by touching the bleeding point with the actual cautery, and immediate application of pressure after removal of the spatula will in large measure prevent hemorrhage into the anterior chamber even in inflamed, very hard, chronic glaucomatous eyes, operated on under gas and oxygen.

We have noticed that such slight amount of blood as has appeared in the anterior chamber has been of venous color. We believe that in part it was sucked in from the conjunctival wound and that there is never occasion for arterial hemorrhage unless it be in the case of marked general vascular disease with arterial degeneration. Even in these instances we cannot but think that it is avoidable. Furthermore, in our opinion, postoperative instillation of mydriatics, which is advised as a routine procedure to prevent formation of pupillary synechiae, should be avoided whenever possible and especially in cases of shallow anterior chamber. It will be found that if the operation is performed with sufficient lack of traumatism, immediate mydriasis is often not necessary. Mydriasis, we believe, may favor closure of the dialysis by approximating the base of the iris to the site of its previous insertion, and in cases of very shallow chamber may also occlude the rest of the angle along with the cyclodialyzed

part, as we have had occasion to observe, and precipitate an acute attack of glaucoma. We have further found that when the dialysis cleft is very great in extent, hypotony is apt to ensue with gradual cataract formation or acceleration of an incipient one.

Theoretically, the question may be asked whether the dialysis acts by disturbing the function of the ciliary body through severance of its nervous and vascular supply, with consequent atrophy and reduced production of aqueous, or whether it acts by permitting outflow of aqueous through the cleft into the suprachoroidal space where it is absorbed. As a result of our observations, we cannot but believe that the question must be answered in the latter sense. In every case of cyclodialysis, the operation has severed the same nerves and vessels and has cut off the ciliary body from its supply whether successful in reducing tension or not, whether establishing communication between the anterior chamber and the suprachoroidæa or not, whether or not causing permanent dialysis. In those cases which showed the dialysis, tension was always found to be reduced. The reduction of tension was

immediate (that is, within twenty-four hours and before atrophy could have developed) and remained so. In the unsuccessful ones tension was either not reduced at all or after initial reduction became increased after a time, when it was found that the ciliary body was reattached. The only difference between the successful cases and failures would then seem to be that in the former a dialysis or cleft persists whereas in the latter reattachment occurs.

Summary

Our gonioscopic investigations show that the establishment of communication between the anterior chamber and the suprachoroidæa is the mechanical *sine qua non* in the successful action of cyclodialysis in cases of primary glaucoma observed by us. This is of evident surgical and clinical importance. In practice, the method has the added advantage of enabling us to determine the reason for lack of effect of the operation in a given case and of indicating when a repetition of the operation is necessary in order to establish the permanent dialysis which insures a successful result.

490 Post Street.

References

- ¹ Fuchs, E. Ablösung der Aderhaut nach Staroperationen. Arch. f. Ophth., 1900, v. 51, p. 199.
- Ablösung der Aderhaut nach Operationen. Arch. f. Ophth., 1902, v. 53, p. 375.
- ² Heine. Handbuch der Augenheilkunde, 1922, v. 1, pp. 872, 878.
- ³ Elschnig, A. Zur Wirkungsweise der Zyklodialyse. Ber. d. Deutschen Ophth. Gesell., 1932, p. 277.
- ⁴ Salus, R. Die Zyklodialyse. Klin. Monatsbl. f. Augenh., 1920, v. 64, p. 433.
- ⁵ Krauss. Zur Frage der Zyklodialyse. Ztschr. f. Augenh., 1908, v. 20, p. 50.
- ⁶ Meller, J. Die Zyklodialyse und ihr Einfluss auf die intraokulare Drucksteigerung. Arch. f. Ophth., 1908, v. 67, p. 476.
- ⁷ Bunge, E. Ueber Dauerresultate nach der Zyklodialyse. Klin. Monatsbl. f. Augenh., 1933, v. 90, p. 21.
- ⁸ Barkan, O. The structure and functions of the angle of the anterior chamber and Schlemm's canal. Address before the Western Ophthalmological Society, June, 1935.
- ⁹ Barkan, O., Boyle, S. F., and Maisler, E. On the genesis of glaucoma. An improved method based on slitlamp microscopy of the angle of the anterior chamber. Trans. Pacific Coast Oto-Ophthalmological Society, Portland, Ore., 1935.

THE KAYSER-FLEISCHER RING IN WILSON'S DISEASE AND MICROCEPHALY

LOUIS BOTHMAN, M.D. AND D. E. ROLF, M.D.
CHICAGO

The Kayser-Fleischer ring found in Wilson's disease is probably not so rare as is commonly believed, for the four cases reported were seen during a period of nine months. Three of these were unquestioned cases of Wilson's disease though none of the patients had an enlarged liver or impaired liver function. The fourth case was that of an eight-year-old girl with microcephalus, whose brother's case of Wilson's disease is reported in the series. In no case thus far reported has the Kayser-Fleischer ring been observed in so young a patient nor has it ever been previously found associated with microcephalus. This child had evidence of pyramidal disease and may yet develop the true Wilson's symptom complex. The presence of the ring in so young a patient would indicate that it does occur early but escapes notice until the disease has advanced to the point where a diagnosis of lenticular degeneration can be made. From the Division of Ophthalmology, Department of Surgery, The University of Chicago, E. V. L. Brown, Director. Read before the Chicago Ophthalmological Society, May 13, 1935.

Wilson's disease is a rare neurological condition about the etiology of which little is known. This symptom complex resembles the pseudosclerosis of Westphal-Strümpell and the two terms are very frequently interchanged. The disease consists essentially of a degeneration of the corpus striatum associated with a cirrhosis of the liver.

The first case was described by Westphal¹ in 1883, and eleven years later (1894) he ascribed the term pseudosclerosis to it. In 1898, Strümpell² reported a case in which he ascribed the peculiar pigmentation of the skin to argyrosis. In 1912, Wilson,^{2, 3} on the basis of earlier works, studied a case *post mortem* and described the essential pathological changes consisting of glial proliferation, colliquation necrosis and hole formation in the corpus striatum, especially in the region of the putamen and globus pallidus. He called the condition *degeneratio lenticularis progressiva*, and in 1933 reported two more cases.

Prior to 1900, the cases were grouped with those of multiple sclerosis in spite of the fact that nystagmus and optic-nerve changes were absent. The familial tendency was noticed even at this early date.

The ring which is typical of the condition and has in recent times been known as the Kayser-Fleischer ring, was first described by Kayser⁴ in 1902. This was found in a 23-year-old patient who had what was believed to be multiple sclerosis. The periphery of the

ring was yellowish white and toward the center it was of a yellowish-green color. The exact depth of the ring in the cornea was not known. In 1903, Fleischer described the ring in a patient who was thought to have multiple sclerosis.

In 1908, Salus⁵ described a similar ring in a patient of his own but was still under the mistaken belief that his patient had multiple sclerosis.

In 1909 and 1912, Fleischer^{6, 7} designated the ring as a part of a hitherto unknown clinical entity. In this he drew for support on the work of Rumpel who found pigment in Descemet's membrane, the lamina vitrea, and the pia mater of the brain.

Rumpel⁸ and the chemist Söldner in 1909 demonstrated that silver was the basis of the pigment. In 1913, in a further study, Söldner found .00328 gm. of silver and antimony, and 0.0495 gm. of copper per 100 gm. of liver.

Rumpel called the disease pseudosclerosis. He believed that insufficiency of the liver led to a disturbance of the various bodily organs which in time caused a metabolic disturbance; this, in turn, producing an acute intoxication which brought on the visceral and psychoneurologic symptoms. He intimated that there must exist an association between the liver disturbance and the corneal pigment.

Forscher Hall,⁹ in 1921, from a study of 9 cases stated that the pigment was endogenous, organic, perhaps of hemogenous origin but was *not* silver.

In 1922, Fleischer,¹⁰ after further studies, came to the conclusion that the pigment was not silver. He considered it to be an endogenous pigment derived from hemoglobin.

In 1922, Siemerling and Oloff¹¹ and Vogt¹² concluded that there was no silver nor copper in the pigment.

Kubik,¹³ in the same year, studied the pigment in Descemet's membrane by means of the Elschmig spectroscopic method and by means of the absorption bands and came to the conclusion that the pigment was closely allied to urobilin.

Metzger,¹⁴ in 1922, imbedded the pigment in celloidin and noticed that it slowly dissolved and disappeared. He considered it to be a lipid pigment.

In 1925, Hessberg,¹⁵ in his case complicated by a coloboma, found a change similar to that of the cornea in the anterior-lens periphery. He considered this to be urobilin.

According to Hugo Spatz,¹⁶ the corpus striatum and also the substratum nigra showed a higher iron content than normal and he believed that there was a special chemical relationship. The intimation here of course was that the ring had iron as its basis.

Enlarging on their original work (1913), Rumpel and Söldner, together with Oloff and Vogt,¹⁷ in 1930 determined that the ring consisted essentially of silver. In fact, Vogt determined a measurable amount of silver in a patient with Wilson's disease.

D. L. Poe¹⁸ gave an ingenious explanation for the formation of the pigment ring. His view was that the corneal changes represent the derivatives of substances that are washed into circulation in the course of cirrhotic destruction of the liver. Probably the same processes are responsible for the lenticular changes in the cerebrum. Strangely enough, the hepatic degeneration eludes modern clinical tests and the increase of the icteric index is not constant. The author believes that increase of these substances in the aqueous, even in the minutest quantities, may by bathing Descemet's membrane at the periphery, at the anterior border ring of Schwalbe, cause a biochemical

reaction resulting in a Kayser-Fleischer ring.

In 1934, Gerlach and Rohrschneider,¹⁹ Fleischer and Gerlach,²⁰ as well as Rohrschneider alone²¹ made spectroscopic analyses of the cornea and liver and found no silver present. However, they did find physiological amounts of copper which in their opinion had no relationship to the ring.

Associated phenomena

Several interesting phenomena have been associated with this condition.

1. In 1922, Siemerling and Oloff²² described the sunflower or copper cataract in a patient with Wilson's disease. It was situated in the anterior portion of the lens, was of grayish-blue color and resembled a sunflower. The center was lighter than the periphery. It looked like a Purtscher pseudocataract. (This consists of a very delicate shimmering membrane situated in the anterior layer of the lens capsule. It can be seen only by oblique light and has a shimmering reflex of rainbow colors with red and green components predominating. It is pathognomonic of copper in the eye.)

This lens phenomenon was also noted by Vogt²³ in two cases. He thought it was due to copper poisoning and liver intoxication. Oloff, Hessberg, and Kubik also noted a peculiar color of the lens in two cases of their own, which were similar to Vogt's cases.

In 1927, Jess²⁴ studied Oloff's case histologically and found no cataract. He concluded that the appearance of the lens was due to a deposit on the anterior lens capsule and thought that there was a pigment derived from urobilin.

2. Fleischer and Metzger each reported a case of Wilson's disease with night blindness. Fleischer ascribed it to a hypothetical pigmentation of the lamina vitrea, while Metzger attempted no explanation at all.

3. W. I. Ling (1932) reported four cases, one of which Pillat²⁵ studied in detail; that of a young Chinese farmer 24 years of age who showed peculiar grayish-white spots in the retina. These were chiefly in the upper half of the

fundus and most numerous toward the periphery. They were 1 to 2 vein widths in diameter, round or oval, and white with a tinge of grey. The outlines were well defined, being blurred only in a few spots. The retinal vessels were in front of the dots, and had no relationship to them. The dots were present in both fundi but less marked in the left. Parts of the retina had a grayish-red appearance, which the author thought was a more special retinal degeneration.

4. L. Heine²⁶ (1933) reported the case of a 45-year-old woman with paralysis of the pupils, which did not react to light, and eyes which could not be elevated though there was no ptosis. He thought this was due to lues, though the Wassermann was negative.

Symptoms

Clinically, the symptoms begin insidiously with a tremor of the extremities which has a constant rhythm and a rate of 4 to 8 oscillations per second. Ultimately, it involves the body and the head, though to a lesser extent than the limbs. The tremor is aggravated by emotion and effort. Occasionally there are tonic and clonic movements but no athetoses. Together with the tremor, or shortly following it, there is hypertonia. The muscles gradually become hard and rigid. Those of the extremities become affected before those of the trunk and show resistance to passive motion. As the disease progresses, the rigidity becomes so marked that the patient cannot keep his balance—the body and limbs forming one piece. As a result of the hypertonia, contractures develop in the extremities. These contractures may be limited to one side or be bilateral and give rise to a picture simulating double hemiplegia.

The gradually increasing rigidity of the facial and speech musculature makes articulation difficult, leading first to dysarthria and ultimately to anarthria.

Drooling of saliva develops as a secondary symptom and finally also dysphagia; both from the muscular rigidity.

Despite the absence of fine paralyses, all the movements are gradually slowed

by the rigidity, but reflex and involuntary movements are preserved for a long time. Muscular weakness, generalized atrophy, and emaciation become marked, especially in cases which progress more or less acutely.

Most patients develop anorexia and not a few complain of dull pains. Psychic or mental changes and emotional disturbances are evident in practically all cases. The patients show irritability, childishness, and ultimately dementia. Involuntary laughter is not uncommon and occasionally there is a peculiar spastic grin, the result of contracture of the facial muscles.

The deep and superficial reflexes are preserved and sometimes lively, but ultimately they cannot be elicited because of rigidity and contracture.

The Babinski sign is negative and as a rule there are no pupillary anomalies, ocular palsies, or nystagmus.

In the pseudosclerosis of Westphal, which is a closely related disease, the degeneration is more widespread and there are pathological findings in the thalamus, hypothalamus, pons, and dentate nucleus. In this condition, optic atrophy is occasionally found.

Pathology

In 1912, Alzheimer and Von Hösslin²⁷ found giant cells in the corpus striatum, the thalamus opticus, and the nucleus dentatus. They also described an absence of ganglion cells in the various parts of the cortex. Such widespread changes in the brain suggested changes in the retina, more like the changes found in cerebro-macular degeneration.

Tsiminakis²⁸ found an increased galactose output, a diabetic blood-sugar curve, and increased bilirubin content of the serum.

F. Lüthy²⁹ after a thorough study of several cases came to the following conclusions: 1. The liver was the first organ to be involved. 2. There were no true cases without cirrhosis. 3. The brain changes were intimately associated with the liver damage. 4. The brain-tissue had a predisposition for the toxins liberated by the liver. 5. The metabolic disturbance was the primary change causing the liver damage.

According to Lüthy, there were three stages in the disease:

1. Cirrhosis.
2. Nervous symptoms.
3. Progressive decrease of mobility.

Miskalcz³⁰ studied the brain in great detail. He correlated the results of his observations with those made on the liver and concluded that the liver atrophy began during the life of the fetus. These findings are important if true. They have not been confirmed.

The modern conception of the condition is as follows: the pathological changes are localized in the corpus striatum. They consist of a symmetrical degeneration, probably lipoidal, of the putamen of the lenticular nucleus. The globus pallidus is but slightly involved but there is secondary degeneration of the ansa lenticularis and relative atrophy of the subthalamic body of Luys and the thalamic fibers. The lenticular nucleus, after it has undergone degeneration and atrophy, becomes porous and frequently has large cavities. As the normal structures disappear, they are replaced by glial cells and fibers. The blood vessels have no pathological changes. There is no evidence of inflammation. The liver is shrunken and has advanced multilobular cirrhosis ultimately presenting a typical hobnailed appearance.

The microscope reveals areas of fatty degeneration and necrosis, patches of normal liver tissue, and foci of active degeneration. The spleen is enlarged.

Clinical description of the Kayser-Fleischer ring

The Kayser-Fleischer ring consists of a narrow band or ring of pigment 1 to 2 mm. wide in Descemet's membrane adjoining the limbus. Occasionally it is not quite complete, being semicircular or crescent shaped. The condition is usually bilateral, although not necessarily so. It is most often of a brownish-green color and consists of tiny granules. The density of the ring has been found to increase toward the center by some observers and toward the periphery by others. It is best viewed with the slitlamp.

Course

The course of the disease is slowly progressive and ends fatally in from 2 to 4 years. Occasionally, it runs an acute febrile course terminating within a few months to a year. There is on record one case which lasted 9 years. As a rule, the patient remains a vegetating automaton until death terminates the illness.

Treatment is of no avail.

Case Reports

Case 1. J. G., a male, 16 years of age, and of Jewish parentage, was first seen in the Neurology Clinic on March 13, 1935. He complained of a loss of speech and a tremor, which had been present for seven months, of the right arm and leg. His parents noticed that his speech was less distinct and that it took him a long time to button his shirt while dressing. His speech disturbance had become progressively worse and it was difficult to understand him. His past history was essentially negative. He had had chicken pox and measles from which he recovered without complications. His parents were living and well. A sister, 8 years old, was "abnormal." She is described under Case 2 in this series. One brother had died at the age of 15 years of "dropsy."

The father was apparently a normal person both physically and mentally, the mother definitely psychopathic.

Laboratory Tests. The Kahn and Wassermann reactions of the blood were negative, as were also the blood count and urinalysis.

Eye Examination. The unaided vision in each eye was 1.2—1. There were no ocular symptoms. The eyes were normal except for a 1½-mm. band of pigmentation extending around the cornea, adjoining the limbus, widest above and below and situated in Descemet's membrane. The pigment was dark brown near the limbus and faded into a greenish-blue centrally. The interpupillary distance was 62 mm.

Physical Examination. The patient was a fairly well-developed and moderately well-nourished young white male. His physical examination was essentially negative. The liver was not enlarged. The circumference of the head was 55 cm. That of the father was 53.5 cm.

Neurological Examination. The patient was docile and cooperative and moved with a slow, almost athetoid action. He showed continuously a broad grin which very slowly varied in degree but was practically never absent. He spoke very little and his speech was definitely dysarthric and almost unintelligible. The cranial nerves were all normal except for a fine tremor of the tongue.

The deep reflexes were all present and normal symmetrically. The superficial reflexes were present and the plantar re-

sponses were both flexor. There was no patellar nor ankle clonus. There was a generalized muscular rigidity and definite extrapyramidal cog-wheel rigidity on passive movement of the limbs. There was a fine tremor of the hands and arms at rest which disappeared in action. The gait was slow and shuffling, and the general appearance of the patient was that typical of paralysis agitans but with the distinct difference that there was some expression in the face, and the motor movements were more jerky and wider in extent.

Impression: Bilateral extrapyramidal disease with emotional instability and the appearance of constant euphoria.

Case 2. F. G. was brought to the clinic at our request on March 27, 1935. She was eight years old. Her parents stated that she had been a full-term child delivered with forceps. Her head had been very small at birth and had remained small. She had had difficulty in nursing but had been apparently healthy until she was eight months of age. Then she began to have convulsions of unknown cause. She would lie on the floor and appear to be unconscious for from one-half to one minute. Accompanying the attack was a horizontal nystagmus. No spasmodic nor convulsive movements of the limbs occurred, nor did the patient cry out. The lips became cyanotic and following the attack she complained of pressure "back of the head."

She did not walk until she was four years of age. Neither the date of the appearance of her first tooth nor the age at which she began to talk was ascertainable.

She is unable to dress herself except for putting on her shoes and stockings. Her speech has always been incoherent and even the parents understand little of what she says. She is habitually active and very happy.

Physical Examination. Aside from the small head, 41.5 cm. in circumference, the findings were negative. The liver was not enlarged. The Wassermann test was negative.

Neurological Examination. Neurological examination was made on May 17, 1935. The patient could speak only a few words and her enunciation was very poor. She apparently understood only very simple commands and did not cooperate in any way. She was so mentally retarded as to be incapable of looking after herself in any way except to eat unaided. Her height was 116 cm. and the circumference of her head 41.5 cm.

The cranial nerves were all normal and specifically there was no limitation of conjugate movement in the eyes in any direction; there was no defect in convergence nor in the accommodation reaction and no nystagmus.

The deep tendon reflexes were all present and all were symmetrically increased. The abdominal reflexes were all absent and both plantar responses were extensor. There was no patellar clonus but an unsustained ankle clonus on both sides.

The only form of sensory appreciation which could be tested was pin prick and that appeared to be normally and symmetrically appreciated over all the body.

There was no localized weakness in any limb and no localized atrophy nor deformity, no pyramidal nor extrapyramidal resistance to passive movement in any limb, no tremor at rest nor in movement, and no taxia nor incoordination in the performance of voluntary movements. There was no involuntary movement of any type.

The child walked with no stiffness of the body nor of the limbs, with no ataxia and no evident spasticity. The arms swung freely, and the head was carried erectly upon the shoulders. The facial expression was not intelligent but there was no sign of the slow, excessive smile so characteristic of her brother.

The liver was not enlarged.

Impression: Microcephaly, extreme mental retardation, bilateral pyramidal disease, no extrapyramidal signs.

Eye Examination. The patient appeared to have good vision though accurate testing was not possible. The pupils were round, active, and reacted to light, accommodation, and convergence. There was no nystagmus. The interpupillary distance was 48 mm. The discs and fundi were normal.

In both corneae there was a continuous greenish ring in Descemet's membrane adjoining the limbus with no normal cornea between it and the limbus. The rings were of lighter color than those in her brother's eyes. They were 1 mm. wide nasally and temporally and 2.5 mm. wide at the superior and inferior borders.

Case 3. L. S., a white male, 13 years of age, was first seen in the Pediatrics Clinic of the Bobs Roberts Memorial Hospital on June 22, 1934. He complained of a severe abdominal pain of eight years' duration. He had been a full term, normal infant. At the age of five months he had had a "bloody diarrhea" but made an uneventful recovery and had been apparently normal and healthy until he was five years of age when he began to have attacks of "pain in the stomach," which were frequently associated with vomiting. These most often occurred early in the morning, frequently before breakfast. The vomitus was usually clear liquid. These attacks had continued several times per week since the onset. His abdomen felt distended most of the time and he "lacked pep."

For the past year, he had been on a low carbohydrate diet with some relief. He had had no vomiting but continued to have attacks of indefinite abdominal pains. Constipation was the rule but was alternated with periods of diarrhea lasting two to four days. During this period the patient had become nervous and irritable, and his hands "shook" so that he could hardly write at school. He began to have emotional changes and cried frequently. The patient had enuresis and his mother noted that he passed large quantities (2 quarts) of dark urine in the morning.

He had had chicken pox at the age of three years, German measles at the age of five years, and measles at the age of six years, and had recovered with no complications. His father and mother were both living and well. The family history was negative except that an older sister was "nervous."

Physical Examination revealed a well-developed and moderately well-nourished child who was not acutely ill. There were four or five carious teeth, a few palpable (but not tender) cervical glands, a faint systolic murmur of the apex, and slight tenderness on pressure in the right lower quadrant. His blood pressure was 126.

He was admitted to the hospital. The Mantoux test, 1:1000, was negative, as were the Kahn and Wassermann reactions of the blood. His blood count, urinalysis, stool examinations, urea index, and urea nitrogen were all normal. The proctoscopic examination revealed a normal rectum and lower sigmoid. X-ray examination revealed a normal esophagus, stomach, duodenal bulb, and colon. The patient was placed on a low-residue diet and at the time of his discharge from the hospital, three weeks later, he had definite relief from his abdominal pain. No clinical diagnosis was established.

The patient was readmitted to the neurological service on December 9, 1933.

Neurological History. His principal difficulties at this time were: (1) uncoordinated movements of the left arm and hand with a progressive loss of strength, of 16 months' duration; (2) difficulty in speech without aphasia and a tendency to drool saliva for 14 months; (3) sharp shooting pain up and down the left arm and to some extent the left leg, especially during the last few months.

Six weeks after his discharge from the pediatric clinic the patient began to have trouble buttoning his clothing. He thought that his hands were "numb." There was no associated pain. A few weeks later, the patient developed a tremor of the hands which tended to disappear with rest. Two months later, the patient's speech became slow and blurred, and he drooled saliva from the right side of his mouth. For the last few months, he had had continuous dull, aching pains in the left arm and leg. He also noticed a slight weakness of his left leg at this time. Recently the patient had a feeling of falling backward and at times a desire to walk backward. He had passed from 2 to 4 quarts of urine daily for the past four months and he had become more nervous and irritable. His father noted that the patient's breasts were somewhat feminine in outline.

Neurological Examination revealed an alert intelligent youth of 15 years, with no evidence of psychic disturbances. The body was slender with no adiposity. Genitalia were well formed. The pubic hair was of feminine distribution. The breasts were feminine in contour. Cranial nerves I, II, III, IV, V, and VI were normal. Chvostek's sign was present on both sides. Hearing was

good. Palatal reflexes were absent. Pharyngeal reflexes were present and fairly active. The tongue protruded on the mid line slowly and with a coarse tremor of the Parkinson type. There was marked dysarthria. Strength was moderately decreased in all movements of the left hand and left lower extremity. The facies was not masklike. The patient smiled fairly easily with fair mobility. The gait was normal except for the fact that the right arm was held flexed at the elbow while the left was held extended. The fingers of both hands were extended at the interphalangeal joints, flexed sharply at the metacarpophalangeal joints, and the thumbs were abducted. There was a fine tremor of the outstretched hands, in addition to a quick, coarse, irregular tremor of the entire left upper extremity. The tremor tended to disappear at rest and was present in action although less marked than when the extremity was merely held outstretched. There was a fine tremor of the lower extremity in action but no tremor of the head. There was a cogwheel resistance of all extremities to passive manipulation most marked on the left arm. The muscular irritability to percussion was everywhere normal.

Superficial sensation was intact everywhere except on the dorsum of the left hand in an ill-defined area involving the thumb, the first, second, and third fingers, and the distal part of the thumb. Pain, touch, and temperature were decreased equally. Deep sensation was intact everywhere.

An encephalogram showed atrophy of both caudate nuclei.

The deep reflexes were uniformly increased. The planter responses were flexor. There was no ankle nor patellar clonus on the right side but it was present on the left.

The liver was not enlarged.

Eye Examination. The eye examination was negative except for a fine greenish-yellow punctate ring 1 mm. in width adjoining the limbus. This ring gradually faded into clear cornea. It could not be seen with the unaided eye. With the Comberg slitlamp the pigmentation was seen to lie in Descemet's membrane. It was slightly wider above and below than medially and laterally.

Case 4. S. R., a white male, 24 years of age, and of Polish parentage, was first seen in the clinic on October 10, 1934, because of a tremor of the hands, arms, and head which had been present for the past four or five years.

He had been a full term, normal infant, and had been in good health until at the age of two years he had had "rheumatism." At that time he had been confined to bed for 18 months because of complete paralysis and difficulty in speaking or swallowing, able only to move his head slowly from side to side. He does not know if there was any associated fever. This paralysis gradually disappeared in seven months and he had been quite normal again as a child and had lived a normal life through adolescence. He

had had no acute illnesses of any kind. He went to school and finished the eighth grade at the age of 16 years.

Four or five years previously, he noticed a coarse tremor of the fingers of the left hand. This progressed to the left arm and one month later the right arm was similarly involved. One month after that he developed a tremor of the head. While lying relaxed in bed, there was no movement. On attempting to dress himself or make any movements with his hands, the tremor was aggravated. He thought he felt better while walking.

Two years ago he suddenly had lost consciousness and fallen on his back. His eyes were turned upward and there was a generalized rigidity. This had lasted about two minutes. There had been no other convulsive attacks. The family history was entirely negative.

Physical Examination revealed a well-developed and fairly well-nourished young male who displayed a coarse rhythmic tremor of the head, mainly lateral, and also a similar tremor of the upper extremities. He had a normal play of facial expression and seemed fairly intelligent.

Eye Examination. The unaided vision was O.D. 1.5—3; O.S. 1.5—4. There was a mild bilateral ptosis. External ocular movements were normal except for an occasional horizontal rotatory nystagmoid jerk on extreme lateral abduction. Each cornea had a typically prominent deposit in Descemet's membrane, arranged in an irregular ring adjoining the limbus. It varied from brown to golden green in color and was 1.75 mm. in width above and below, and 1 mm. laterally. The discs were normal and the fundus was of the "tigroid" type.

Neurological Examination. There were no sensory changes of the face. There was a moderately coarse rhythmic tremor of the jaw. The palatal reflexes were weak but the pharyngeal reflexes were brisk. The tongue was protruded in the mid-line and showed a coarse tremor. There was also a coarse tremor of the fingers and hands, more marked on the left than on the right, which appeared with the slightest voluntary activity. In the finger-to-nose test, the first half of the movement was quieter than the second and he was unable to keep his finger on the tip of his nose. There was a moderate, uneven tremor of the unsupported head. A slight action tremor of the left leg was present. There was slight hypotonicity of the muscles of all four limbs. His speech was jerky and indistinct.

The liver was normal in size and in consistency and liver-function tests (bromsulphalein and galactose tolerance) were normal.

Laboratory Tests. The blood Wassermann and Kahn reactions were negative and microscopic examination of the blood and urine showed no abnormality. An encephalogram revealed slight dilatation of the third ventricle and some increase in the sulcus marking over the surface of the brain. The remaining ventricles were normal in size and shape.

Comments

The occurrence of the Kayser-Fleischer ring is not so rare as has been commonly believed, for the four cases here recorded were seen within a period of nine months.

In the classical description of Wilson's disease, there is involvement of the liver, yet in the three unquestioned cases of this condition here recorded none showed either an enlarged liver or disturbed liver function. This is in accordance with most of the cases now on record in the literature. In the fourth case also, the liver was of normal size.

Case 2 is of unusual interest because of the presence of the Kayser-Fleischer ring in a child showing microcephaly but as yet no evidence of extrapyramidal disease. The patient is only eight years old and may still develop a true Wilson's symptom complex. Her brother (case 1) began to develop symptoms at 15½ years of age. In no previous report has the Kayser-Fleischer ring been described in so young an individual. Its presence at this age may indicate that it does occur early and escapes notice until after the pronounced extrapyramidal signs lead to a diagnosis of lenticular degeneration.

Conclusions

1. Three fairly typical cases of lenticular degeneration with Kayser-Fleischer ring are described.

2. Signs of pyramidal disease and microcephaly together with a typical Kayser-Fleischer ring are described as occurring in the younger sister of one of the patients with true Wilson's disease.

122 South Michigan Avenue.

Bibliography

- 1 Westpahl, C. Ueber eine dem Bilde der cerebrospondylischen grauen Degeneration ähnliche Erkrankung des centralen Nervensystems ohne anatomischen Befund nebst einige Bemerkungen über paradoxe Contraction. Arch. f. Psych., 1883, v. 14.
- 2 Wilson, S. A. K. Progressive lenticular degeneration: A familial nervous disease associated with cirrhosis of the liver. Lancet, 1912, v. 1, p. 1115.

- ¹ ———. Progressive lenticular degeneration: A familial nervous disease associated with cirrhosis of the liver. *Brain*, 1912, v. 34, pp. 295-509.
- ⁴ Kayser, B. Ueber einen Fall von angeborener grünlicher Verfärbung der Cornea. *Klin. Monatsbl. f. Augenh.*, 1902, v. 60, pp. 22-25.
- ⁵ Salus. Grünliche Hornhautverfärbung bei multiple Sclerose. *Med. Klin.*, 1908, v. 1, p. 495.
- ⁶ Fleischer, B. Die peripherie braungrünliche Hornhautverfärbung als Symptom einer eigenartigen Allgemeinerkrankung. *Münch. med. Wchnschr.*, 1909, v. 56, p. 1120.
- ⁷ ———. Ueber eine der "Pseudosclerose" nahestehende bisher unbekannte Krankheit gekennzeichnet durch Tremor, psychische Störungen, bräunliche Pigmentierung bestimmter Gewebe, insbesondere durch die Hornhautperipherie, Leberschirrheose usw. *Deutsche Ztschr. f. Nerven.*, 1912, v. 44, p. 179.
- ⁸ Rumpel. Ueber das Wesen und die Bedeutung der Leberveränderung und der Pigmentierung bei den damit verbundenen Fällen von Pseudosklerose, zugleich ein Beitrag zur Lehre von der Pseudosklerose (Westphal-Strümpell). *Deutsche Ztschr. f. Nerven.*, 1913, v. 49, p. 54.
- ⁹ Hall. La dégénération hepato-lenticulaire (Maladie de Wilson Pseudosklerose). Paris, Masson et Cie, 1921.
- ¹⁰ Fleischer, B. Ueber den Harnsoderinring im Hornhautepithel bei Keratokonus und über den Pigmentring in der Descemetischen Membran bei Pseudosklerose und Wilsonscher Krankheit. *Klin. Monatsbl. f. Augenh.*, 1922, v. 68, p. 47.
- ¹¹ Siemerling, E., and Oloff, G. Pseudosclerose (Westphal-Strümpell). *Klin. Wchnschr.*, 1922, v. 1, p. 1087.
- ¹² Vogt, A. Zur Genese des Sonnenblumenstars. *Klin. Monatsbl. f. Augenh.*, 1928, v. 81, p. 712.
- ¹³ Kubik. Zur Kenntnis des Kayser-Fleischerschen Ringes. 1922, v. 69, p. 838.
- ¹⁴ Metzger. Fleischerscher Hornhautring bei hepatolenticuläre Degeneration. *Klin. Monatsbl. f. Augenh.*, 1922, v. 69, p. 838.
- ¹⁵ Hessberg. Klinischer Nachweis und Analyse u.s.w. *Klin. Monatsbl. f. Augenh.*, 1925, v. 75, p. 12.
- ¹⁶ Spatz, H. Ueber den Eisennachweis im Gehirn besonders in den Zentren des extrapyramidal-motorischen Systems. *Ztschr. f. d. ges. Neurologie*, 1922, v. 77, p. 261.
- ¹⁷ Vogt, A. Lehrbuch und Atlas der Spaltlampenmikroskopie des lebenden Auges, Berlin, Julius Springer, 1930, v. 1, p. 157.
- ¹⁸ Poe, D. L. Kayser-Fleischer ring in the cornea in a case of Wilson's disease. *Amer. Jour. Ophth.*, 1930, v. 13, p. 1045.
- ¹⁹ Gerlach and Rohrschneider. Pigment of the Kayser-Fleischer ring. *Klin. Wchnschr.*, 1934, v. 13, p. 48.
- ²⁰ Fleischer, B., and Gerlach, W. Pigment of the Kayser-Fleischer ring. *Klin. Wchnschr.*, 1934, v. 13, p. 255.
- ²¹ Rohrschneider, W. Untersuchungen über den in der Hornhaut des Auges bei der hepatolenticulären Degeneration abgelagerten Farbstoff. *Arch. f. Augenh.*, 1934, v. 108, p. 491.
- ²² Siemerling, E., and Oloff, G. Pseudosklerose (Westphal-Strümpell) mit Cornealring (Kayser-Fleischer) und doppelseitigem Scheinkatarakt. *Klin. Wchnschr.*, 1922, v. 1, p. 1087.
- ²³ Vogt, A. Lehrbuch und Atlas der Spaltlampenmikroskopie des lebenden Auges. Berlin, Julius Springer, 1930, v. 1, p. 159.
- ²⁴ Jess. Die Pigmentierung der Linse bei Pseudosklerose in histologischem Schnitt. *Klin. Monatsbl. f. Augenh.*, 1927, v. 79, p. 145.
- ²⁵ Pillat, A. Changes in the eyegrounds in Wilson's disease. *Amer. Jour. Ophth.*, 1933, v. 16, p. 1.
- ²⁶ Heine, L. Ocular disturbances in pseudo-sclerosis. *Klin. Wchnschr.*, 1933, v. 9, p. 433.
- ²⁷ Von Hösslin, C. and Alzheimer, A. Ein Beitrag zur Klinik und pathologischen Anatomie der Westphal-Strümpellscher Pseudosklerose. *Ztschr. f. d. ges. Neurol.*, 1912, v. 8, p. 183.
- ²⁸ Tsiminakis, T. Demonstriert zwei Fälle von Wilsonscher Krankheit mit Kayser-Fleischerschem Ring. *Ztschr. f. Augenh.*, 1931, v. 75, p. 103.
- ²⁹ Lüthy, F. Ueber die hepato-lenticuläre Degeneration. *Deutsche Ztschr. f. Nerven.*, 1931, v. 123, p. 101.
- ³⁰ Miskalczy. Wilsonsche Krankheit und Kleinhirn. *Arch. f. Psych.*, 1932, v. 97, p. 27.
- ³¹ Strümpell. Ueber die Westphalsche Pseudosklerose und über diffuse Stirnsklerose besonders bei Kindern. *Ztschr. f. Nerven.*, 1898, v. 12, p. 115.
- . *Ibid.*, 1899, v. 14, p. 348.

SUBJECTIVE STUDIES OF THE BLIND SPOT AND VISUAL FIELDS

EDWARD JACKSON, M.D.
DENVER

The author gives his experience in observing his own blind spots over a period of years. They may be seen by closing the eyes when facing the sun, or in bright daylight, or when facing a 100-watt electric lamp placed within two feet of the eyes. They are to be recognized by their shape, position, and movements. It is of value to ophthalmologists to understand this phenomenon because patients who are ignorant of the existence of blind spots complain of it. Read before the American Ophthalmological Society at Hot Springs, Virginia, June 5, 6, 7, 1935.

Study of the blind spot as a scotoma has been common of late years, especially the study of its enlargements in connection with certain diseases. The blind spot has been known for over two hundred and fifty years, since Mariotte called attention to it. Helmholtz made excellent studies of the blind spot by various methods, and Wilbrand has investigated methods for its detection and measurement. There seems to be no mention in the literature of the subjective method of viewing the observer's own blind spots—the size, shape, position in the field of vision, movements, and relation to retinal adaptation, or afterimages. Apparently no one has suspected that such observations might be of practical importance. The frequent watching of my own blind spots for several years has proved interesting; and an unsuccessful search of the literature for such observations suggests that it is a subject of sufficient importance to warrant me in bringing it to the attention of this Society.

Closing the eyes when facing the sun, or in bright daylight, or facing at night a 100-watt electric lamp placed within two feet of the eyes, one can perceive two dark spots in the luminous visual field; these by their shape, position, and movements are readily identified as the blind spots of the visual field. The experiment has been tried by a number of persons; and so far, no one who has intelligently performed it has failed to recognize his blind spots. The conditions necessary for such recognition are: the light must be bright enough, the illumination must be nearly uniform throughout the field, the retinas must be light-adapted, and a few seconds must be allowed for the scotomas

to appear. On covering one eye, the scotoma belonging to this eye disappears, and a few seconds are needed for its reappearance, once the eye has been uncovered.

Closure of the eyes is necessary to obtain a uniform illumination of the field. The light entering through the normal lids is quite sufficient for the experiment. The waiting period is generally needed to secure the best adaptation, and to dispel the afterimages of objects previously looked at that obscure and attract the attention from the phenomenon sought. There must be freedom from strong dominating retinal images, but an absolutely uniform field is not essential. The spots can be seen against a clear sky or a uniformly light cloud, with the eyes open. In the same way they can be detected against a wall of a uniform tint; or on a wall covered with a light paper of nearly uniform tint, or at least free from any sharply outlined figures. At first there is difficulty in finding the phenomenon sought, since one does not know just what to look for. The same difficulty is encountered when attempting to see the circulation of the blood in the region of the macula.

The first striking characteristic of these spots is that they seem almost constantly to be moving in the field of vision. Both spots make the same movements, generally from side to side, but sometimes up and down or obliquely; but each spot always moves in the same direction and to the same extent as its fellow. This conjugate relation distinguishes the spots sharply from other scotomas and from the shadows cast by vitreous opacities on the retina—the common *muscae volitantes*.

It is not easy to arrest the motion of the spots, nor to control it entirely; although voluntary turning of both eyes up or down, or to the right or left, is easily recognizable in the apparent direction of the spots. The distance between the two spots is not readily varied by efforts of increased or decreased convergence. This finding agrees with what Helmholtz observed as regards judging the position of the blind spots and being able to ascertain the distance from his eye to his finger by touch.

There is generally no fixed point within the visual field with which the position of the blind spots can be compared. As a rule, however, the consciousness of motor action of the muscles of the orbit, neck, and head gives a convincing sense of their apparent direction. Probably this sense of direction is subject to the same errors as may be encountered by observing the apparent direction of a light with the eyes open but with the neck, head, and trunk twisted into unusual positions. The apparent direction of the two spots in the common visual field gives conclusive evidence that they are physiologic blind spots. They are more convincing than the earlier demonstration of a circle and a cross, in which fixing the cross with one eye at the proper distance, the circle was swallowed up in the blind spot. With both blind spots before our eyes, it is impossible to direct the eyes so that any point in the field shall fall in both spots at once, and so disappear entirely from consciousness.

It might seem that the movements of the blind spots could be studied in comparison with the movements of definite afterimages. Definite afterimages, however, are obtained best with strong light in a dark-adapted eye. The blindspots become most visible when the eye is light-adapted—hence comparison is difficult. Attempts at such comparison seem to show that different factors enter our consciousness of the movement of afterimages from those concerned in the search movements of the blind spots. It may be that the latter are wholly retinal, whereas afterimages depend for their apparent directions on

the impressions made on nerve cells of the cerebral cortex. This is a subject for further investigation.

The peculiar limited up and down, right and left, conjugate movements of the two blind spots seem to indicate that they represent fundamental coordinations of the movements of the two eyes which lie deeper than the functions of binocular fusion and binocular vision. It is reasonable to assume that these movements are closely associated with orientation of directions, developed for the harmonious association of the visual fields of the two eyes, that existed before ocular movements were dominated by macular vision, with perfect correspondence of foveal images and the perfecting of binocular foveal fixation.

The color of the blind spots thus seen is a neutral gray, which varies little with differences in the color of the field on which they are seen, or with previous exposure to colors by strong light. With the sun shining on the closed lids, there appears but little tendency to see a complementary green against the decidedly red tint of the general field. When the field is white, as seen with strong mercury-vapor blue light, no yellowish tint can be perceived in the spots. The possible faint tints revealed by such tests are fully explained by contrast of the blind spots with the simultaneous color adaptation of the neighboring retina and the shifting of the spots in the field.

The "seeing" of our own "blind spots" constitutes a paradox that well illustrates the cerebral character of all our seeing. In the mass of sensory cells that constitute the visual centers there is no vacancy—no break—in the continuity of cells prepared to receive impressions made by the visual apparatus. There are cells in position to receive all possible impressions made on the retina, and each is correlated and coordinated to indicate the direction from which light comes, or does not come, to make an impression. It is this permanent coordination for orientation that enables us to see the break in the visual field caused by our own blindspots. The apparatus perfected by long ages of evo-

lution is ready to serve us whether or not we use it. In order to use it, however, we must know that it is there; and in order to apply it to our uses, we must have some knowledge of its functions.

In contrast to the absence in our literature of reference to the subjective appearances of the blind spots is the fact that those who have never heard of the blind spot can recognize the appearance of their own blind spots in their visual fields. Within the last year two patients have come to me because of "spots before their eyes," the only reason for their complaint being a perception of their blind spots. The conditions under which the spots were observed—their size, shape, positions in the visual field, and their movements—all corresponded to those of the blind spots, and examination revealed no pathologic condition that could cause

scotomas or muscae volitantes. An explanation of what it was that they saw, and of the conditions under which they could see the spots, satisfied these patients and no further trouble was experienced. One who has made himself familiar with such spots in his own eyes will have little difficulty in recognizing them by the description given by the patient. Nevertheless there is no doubt as to the annoyance and worry they sometimes cause both patient and physician when the nature of the supposed muscae is not understood.

By acquiring familiarity with the apparent movements of the blind spots it may be possible to reach a better understanding of the complex cerebral processes involved in human vision, and it is because of this that they deserve the attention of ophthalmologists.

Republic Building.

THE EFFECTS OF MYDRIATICS UPON INTRAOCULAR TENSION

HARRY S. GRADLE, M.D.

CHICAGO

This paper does not lend itself to review. It was read before the American Ophthalmological Society, at Hot Springs, Virginia, June 5 to 7, 1935.

Being curious as to the actual effects of mydriatics and cycloplegics upon intraocular tension, tonometric measurements were made upon a series of consecutive private patients past thirty years of age. In order to eliminate extraneous influences as far as possible, the following procedures were adopted:

(1) No case of manifest ocular disease was included in the series.

(2) All tonometric measurements were made by the same person (a trained nurse) with the same instrument (a Gradle-Schiötz tonometer), in the same room, the patient lying flat on the back upon an operating table. The measurements were made under uniform indirect illumination of seven foot-candles, and under the anesthetic effect of two drops of 2 percent butyn given at a 3-minute interval. Every measurement was repeated with two different weights and the average recorded. If a difference of more than 3 mm. Hg was found, the measurements were repeated and rechecked by either Dr. Meyer or me.

(3) The primary reading was made between 9:00 and 10:00 A.M. Then mydriatics were instilled (six drops of 2-percent homatropine hydrobromide at 5-minute intervals, or four drops of 2-percent euphthalmine at 5-minute intervals). Retinoscopy was done, refractive measurements were taken, and a fundus examination was made.

The secondary readings were made approximately two hours after the first drop of mydriatic had been instilled; that is, between eleven and twelve-thirty in the morning.

The final readings were made after the postcycloplegic examination was completed, some 48 to 72 hours subsequent to the primary reading, and usually between ten and twelve-thirty in the morning. The same procedure was followed as in the primary readings.

(4) If, at the second reading, an in-

crease in pressure of more than 4 mm. Hg was found, pilocarpine was instilled and another reading made 15 minutes later. No patient was allowed to leave until the pressure had returned to within the so-called normal range.

Five hundred consecutive patients, that is, one thousand eyes, were examined in this series. Except in the first tables (A, B, C), reference will be made to individual eyes and not to an individual person.

A. General Classification

Males..151 Females..349 Total..500

B. Classification by Age

From 30 to 40 years of age	150
From 40 to 50 years of age	118
From 50 to 60 years of age	88
From 60 to 70 years of age	98
From 70 to 80 years of age	37
From 80 years of age upward	9

Total500

C. Classification According to Mydriatic Used

Homatropine was used in.....	118
Euphthalmine was used in.....	382

Total500

D. Details of Classification by Decades Age 30 to 40 Years

300 eyes with an average pressure of 18.91 mm. Hg.

Minimum pressure, 13 mm. Hg. Maximum pressure, 26 mm. Hg.

9 eyes, or 2.9 percent, increased in pressure from 5 to 17 mm. Hg (average 12.2 mm. Hg).

E. Details of Classification by Decades Age 40 to 50 Years

236 eyes with an average pressure of 19.20 mm. Hg.

Minimum pressure, 13 mm. Hg. Maximum pressure, 26 mm. Hg.

5 eyes, or 2.1 percent, increased in pressure from 5 to 10 mm. Hg (average 7.8 mm. Hg).

F. Details of Classification by Decades Age 50 to 60 Years

176 eyes with an average pressure of 20.05 mm. Hg.

Minimum pressure, 13 mm. Hg. Maximum pressure, 31 mm. Hg.

4 eyes, or 2.2 percent, increased in pressure from 5 to 17 mm. Hg (average 11.7 mm. Hg).

G. Details of Classification by Decades Age 60 to 70 Years

196 eyes with an average pressure of 20.18 mm. Hg.

Minimum pressure, 14 mm. Hg. Maximum pressure, 28 mm. Hg.

4 eyes, or 2.0 percent, increased in pressure from 5 to 17 mm. Hg (average 10.8 mm. Hg).

H. Details of Classification by Decades Age 70 to 80 Years

74 eyes with an average pressure of 18.93 mm. Hg.

Minimum pressure, 13 mm. Hg. Maximum pressure, 26 mm. Hg.

4 eyes, or 5.3 percent, increased in pressure from 5 to 9 mm. Hg (average 7.5 mm. Hg).

I. Details of Classification by Decades Age 80 Years and Upward

18 eyes with an average pressure of 19.3 mm. Hg.

Minimum pressure, 16 mm. Hg. Maximum pressure, 24 mm. Hg.

2 eyes, or 11.1 percent, increased in pressure from 5 to 8 mm. Hg (average 7.5 mm. Hg).

J. Recapitulation of Tables D to I Inclusive

Owing to the very small number of cases in the decade 80+ the percentage of increase of more than 4 mm. Hg is unduly high. If this decade be eliminated, the average percentage of increase of more than 4 mm. Hg is only 2.8.

K. Classification of Pressure According to Refractive Error

Emmetropia: 91 cases, or 9.1 percent. Average pressure, 18.7 mm. Hg.

Hyperopia: 0 to +1.50 sph., 294 cases, or 29.4 percent. Average pressure, 19.4 mm. Hg.

Hyperopia: +1.50 to +3.00 sph., 109 cases, or 10.9 percent. Average pressure, 19.4 mm. Hg.

Hyperopia: +3.00 sph. upward, 58 cases, or 5.8 percent. Average pressure, 19.5 mm. Hg.

Myopia: 0 to -3.00 sph., 312 cases, or 31.2 percent. Average pressure, 19.2 mm. Hg.

Myopia: -3.00 to -10.00 sph., 81 cases, or 8.1 percent. Average pressure, 21.0 mm. Hg.

Myopia: -10.00 sph. upward, 55 cases, or 5.5 percent. Average pressure, 20.2 mm. Hg.

Total average pressure, 19.63 mm. Hg.

L. Comparison of Refractive Errors in This Series and in Glaucoma

It is of some interest to compare the incidence of the various errors of re-

	This Series 1000 Eyes percent	Proved Glaucoma 359 percent
Emmetropia	9.1	6.4
Hyperopia (0 to +1.50)	29.4	39.7
Hyperopia (+1.50 to +3.00)	10.9	18.5
Hyperopia (+3.00 upward)	5.8	15.3
Myopia (0 to -3.00)	31.2	17.4
Myopia (-3.00 to -10.00)	8.1	1.4
Myopia (-10.00 upward)	5.5	1.3

fraction in the series of cases here reported and in an unreported series of 359 cases of proved glaucoma of all types.

Ages	30-40	40-50	50-60	60-70	70-80	80+	Average
Number of eyes	300	236	176	196	74	18	
Average pressure in mm. Hg	18.91	19.20	20.05	20.18	18.93	19.30	19.63
Pressure increased more than 4 mm. Hg	2.9%	2.1%	2.2%	2.0%	5.3%	11.1%	4.26%

M. Variations in Pressure in the Two Eyes of the Same Individual

In many instances, one or the other eye of the same patient presented a higher pressure at the primary reading. Although this had no effect upon the end result, it is of interest from other standpoints to present the figures thus obtained.

Differences in pressure between two eyes in mm. Hg	Right Higher No. of Cases	Left Higher No. of Cases
1 mm. difference	59	69
2 mm. difference	38	46
3 mm. difference	4	6
4 mm. difference	4	4
5 mm. difference	1	1
6 mm. difference	2	1
9 mm. difference	1	0
Total	109	127
TOTAL	236	

This formed 23.6 percent of the total number of eyes in the series in which the pressure was higher in one eye of the patient than in the other.

These tables require but little discussion as the majority are self-evident. Something should, however, be said regarding the 28 eyes that increased more than 4 mm. Hg in pressure under mydriasis. In 9 of the 28 eyes, the tension increased to a point where a definite suspicion of glaucoma was aroused, and further provocative tests proved the suspicion to be correct. But in none of the 9 eyes were there any subjective or objective findings, prior to the use of mydriasis, that pointed toward a glaucomatous tendency. Consequently, it is evident that routine tonometric measurements before and after the use of mydriatics or cycloplegics will bring about the early recognition of a glaucomatous, or rather a preglaucomatous, eye. It must be added that in every one of these cases the hypertension was controlled easily by the use of miotics before the patient left the office.

Summary

1. Five hundred consecutive patients past the age of 30, whose pupils were dilated for the purpose of ocular examination, were measured tonometrically immediately before the use of the mydriatic, 2 hours later, and 48 hours later.

2. The average primary pressure of these 1,000 eyes was 19.63 mm. Hg. The curve of pressure according to age is fairly uniform, being lowest in the 30 to 40 decade, rising steadily to a maximum in the 60 to 70 decade, and again decreasing after the age of 70 years.

3. The refractive error present does not seem to have any influence upon the pressure.

4. The percentage of refractive errors present in this series varies markedly from the percentage of refractive errors present in a series of 359 proved glaucoma cases of various types.

5. In 2.8 percent of the eyes, the pressure increased more than 5 mm. Hg under mydriasis and required the use of miotics to regain the primary level.

6. In 0.9 percent of the eyes, the increase in pressure under mydriasis led to further investigation which established the presence of a preglaucomatous condition.

7. In 23.6 percent the pressure was higher by 1 to 9 mm. Hg in one eye than in the other of the same patient.

Conclusions

In persons past the age of 30 years, tonometric measurements made immediately before and directly after the use of a mydriatic or cycloplegic are highly advisable. Neither the primary nor the secondary measurement alone is sufficient to be conclusive.

By this method, many cases of incipient glaucoma or preglaucomatous conditions may be found from months to years earlier than would otherwise be the case.

58 E. Washington Street.

MAGNET EXTRACTION OF INTRAOCULAR FOREIGN BODIES

Important Points in Technique

ASHLEY W. MORSE, M.D.

BUTTE, MONTANA

The paper deals with practical points of technique as chosen from the viewpoint of the author's experience.

The history first draws attention to a possible foreign body in the eye. Some foreign bodies will be obvious. The important ones are those which are not. Question every patient as to whether a single inflamed eye could have been injured in any way. If it might have been injured, ask exactly what happened, the kind of work the patient was doing, what tools he was using and how, his position, the direction in which he was looking, and what he saw and felt.

There may be no symptoms, and very often no pain. There will be varying degrees of redness, tearing, photophobia, blepharospasm, and change in vision.

The examination should be painstaking and thorough. One should look for minute wounds in the cornea, iris, and lens capsule, and for changes in the refractive media and fundi, using every means at hand (the loupe, slitlamp, and ophthalmoscope). Light thrown behind the iris through the pupil brings out the hole, when otherwise it might not be seen. The sclera may be the point of entrance, although it has been estimated that foreign bodies enter the eyeball two hundred times more frequently through the cornea than through the sclera¹. In almost every case of foreign body in an eyeball, careful search reveals its point of entrance, or its damage to other structures.

The diagnosis having been made, each case must be handled from its individual standpoint. One should know from the history, symptoms, and examination just what structures of the eye are damaged, what the vision is at the time of the first examination, what changes may later occur to alter the vision, and what the foreign body is likely to be, single or multiple, one eye or both, magnetic or nonmagnetic.

A probe should never be used to investigate an injured eye, nor should the eye be touched with any instrument

until one is operating to remove the foreign body. If one considers it necessary, confirm the diagnosis with an X-ray examination.

With the electro-magnet, one removes the foreign body with as little further damage to the eye as possible. If the injury has destroyed the vision, removal of the foreign body will not restore it.

The history, symptoms, examination, point of entrance in the cornea, and the injury to the iris and lens should indicate the approximate location of the foreign body and its size. If one knows just how the patient was working and in what direction he was looking, and can examine the tool used, he has enough information to suggest the best method of extraction.

If a foreign body can be seen with the ophthalmoscope, no X-ray examination is needed. In certain cases, even when it cannot be seen with the ophthalmoscope, it can be located with almost the same exactness by these careful observations. In such cases an X-ray film is not necessary except to check the position. If the anterior route is chosen, exact X-ray localization does not change the operative procedure; moreover, in certain procedures by the posterior route, the X-ray localization is not absolutely necessary, for it does not change the method of operating. If there is no response to the magnet when the history and examination indicate a foreign body, several X-ray films must be taken before one can be satisfied that there is none. In cases of long standing (one month to three years) in which inflammatory changes have taken place, the X-ray examination is of more importance.

I prefer the anterior route if the foreign body is small enough. Haab says it must be 3 mm. or less. Larger pieces, if they have made large wounds in the cornea and lens, will frequently come

out by the same route as that by which they entered; also, in early cases, if the entrance is in the sclera, the foreign body should be taken out at the point of entrance. This would nearly always be easy if it were not that at times the piece of steel, because of its polarity, tends to twist around and often presents a flat side, if it is not far enough away to turn completely around, requiring a larger opening than the point of entrance for its removal.

If the anterior route is chosen, the eye is prepared, anesthetized, and the pupil dilated. The magnet tip is placed over the center of the cornea a little distance from the eye, and the current turned on; if no response, the magnet is brought to the center of the cornea. If the foreign body does not come into and through the posterior chamber, the current is turned off and on several times, while the patient is instructed to look up and down, right and left, in order to bring it up. If the pupil is well dilated with atropine or a subconjunctival injection of cocaine and adrenalin², the foreign body can usually be brought through the pupil into the anterior chamber without damage to the iris. It is surprising how seldom the lens is injured or the iris entangled. If this does occur, a traumatic cataract, in an occasional case, or an occasional iridodialysis or iridectomy, on the whole, gives a better eye than removal through the sclera. If the lens is severely injured by the foreign body as it enters the eye, immediate removal of the traumatic cataract at the time of magnet extraction should be done³.

If the foreign body becomes entangled in the iris, it can sometimes be released by placing the magnet so as to pull it back, or up or down, and toward the limbus, and then applying the magnet above and opposite, rather than directly opposite the foreign body. If it does not then present, an iridectomy is done, and the steel is either removed with the iris, or allowed to come through the iris opening.

The foreign body is removed from the anterior chamber through a keratome incision parallel with the plane of the iris and close to it to avoid a shoulder at the limbus, or, through a corneal incision nearly at right angles to the

cornea so that the foreign body will not catch on the lips of the wound.

If it is known that the foreign body is too large to come around the lens into the anterior chamber, or if it is impossible to bring it there with the magnet, it will be necessary to remove it by the posterior route. In my experience, the best results are obtained by bringing the foreign body to a spot between the lateral and inferior recti and between the ciliary body and the ora serrata, the examination indicating whether it is to be done between the external and inferior rectus, or between the internal and inferior rectus. By this method exact X-ray localization is not necessary. The operative procedure is the same. The magnet is used to bring the foreign body to the selected spot just as one brings the foreign body into the anterior chamber for the anterior route.

When, by pain or bulging of the sclera, one knows the foreign body is in this location when the current is turned on, the conjunctiva is dissected up, and a crucial incision is made in the sclera, the longer being made meridionally (to avoid blood vessels) and the shorter at right angles, both just through the sclera. The choroid and retina are avoided as much as possible, and the vitreous is treated with the same respect that is accorded the lens. The blunt magnet tip is placed in the incision and the current turned on. The tip is left in place half a minute and moved about a little, then very slowly withdrawn. If the foreign body does not come out, the procedure is repeated. Keep trying, studying just what is preventing the piece from coming out, and overcome the difficulty. One may have to nick the choroid and retina, or enlarge the scleral incision. Do not use magnet tips which protrude into the vitreous until removal of the foreign body with the blunt tip has been tried on three successive days. Disturbed vitreous means loss of vision. After working one half to three quarters of an hour, wait until the next day. I have tried unsuccessfully for two days, only to have the foreign body come out at the first attempt on the third day. I have not found that in the cases in which there was no disturbance of vitreous or undue bleeding, more vision

was lost than in those in which the foreign bodies were removed at the first attempt; while trauma to the vitreous has always resulted in lessened vision. If successful, I prefer not to suture the conjunctiva. If, however, at this point there has been failure, an exact X-ray localization is essential before tips are introduced into the vitreous, for considerable loss of vision will follow.

The incision should be made as near the foreign body as possible, using the technique already described, avoiding blood vessels, subjecting the vitreous to minimal disturbance, and using tips which protrude into it only as a last resort.

The disastrous result of trauma to the vitreous was impressed upon me in the following case:

A man presented himself with a piece of steel in his eye which could easily be seen with the ophthalmoscope near the equator, temporally. His vision was still about 20/40. After the usual preparations, the scleral incision was made by boldly plunging the knife into the vitreous then making a short cross cut on one side so that a T incision resulted. There was very little bleeding. The foreign body promptly came out when the blunt tip was placed in the incision, and the wound was not sutured. It was one of the quickest extractions I had ever done, with almost no manipulation. I confidently expected good results. There was no visible bleeding into the vitreous, but the latter became cloudy, and at the end of four days, the time during which I had the patient under observation, vision dropped to 20/100. I still hoped he would improve, but upon examination three months later he had a soft degenerating eye filled with vitreous opacities, and vision for only large moving objects.

In contrast, in a similar case, with vision 20/15, a smaller foreign body, seen with the ophthalmoscope, was removed in the same way, only the vit-

reous was not penetrated, and 20/15 vision was obtained, which has remained for ten years.

As a rule, the conjunctiva has not been sutured. In a few cases, I decided a more surgical procedure would be to suture the conjunctiva, and, unfortunately, in some there was a little bleeding in the incision. The suture forced blood into the vitreous, and opacities and loss of vision followed.

Retinal detachment has been described as a frequent complication in removal by the posterior route, but I have not observed it so often; in most of the cases the foreign body has been removed near or in front of the ora serrata.

Summary

Every inflamed eye should be suspected of containing a foreign body. The history, symptoms, and examination will indicate when and how the magnet should be used. If the wound of entrance is large, the foreign body should be removed through it. If the foreign body is small, it should be removed by the anterior route.

If the foreign body cannot be brought into the anterior chamber, or, if it is large, it should be removed by the posterior route by bringing it, if possible, to a selected spot (1) to avoid bleeding, (2) to avoid vitreous injury, and (3) to lessen retinal detachment.

An X-ray examination is not necessary, for it does not change the operative procedure, if removal is possible by (1) the original wound, (2) the anterior route, or (3) the posterior route as a selected spot.

An X-ray examination is necessary (1) when there is no response to the magnet in cases of suspected foreign body, (2) when the foreign body cannot be brought to the selected spot posteriorly, (3) when the magnet has failed to remove the foreign body, (4) in cases of long standing, and (5) in certain cases to confirm the diagnosis.

References

- ¹Samuels, B. Demonstration of microscopical preparations of eyes containing foreign bodies. *Surg. Gynec. Obst.*, 1932, v. 14, Feb. 15, p. 414.
- ²Barkan, O. A procedure for the extraction of congenital soft membranous cataract. *Amer. Jour. Ophth.*, 1932, v. 15, p. 117.
- ³Donovan, J. A. The immediate removal of traumatic cataract *Jour. Amer. Med. Assoc.*, 1911, v. 57, July 15, pp. 196-197.

NOTES, CASES, INSTRUMENTS

ACUTE GLAUCOMA SECONDARY TO RELAPSING FEVER FOL- LOWED BY UVEITIS*

Case Report

W. H. ROBERTS, M.D.
PASADENA, CALIFORNIA

J. M., aged 34 years, a golf professional in robust health, spent the summer of 1930 at Lake Tahoe where he was occupied in laying out a golf course. Two weeks prior to his admission to the Pasadena Hospital, on September 21, 1930, he had begun to feel "sick all over." He had had fever, chills, some headache, and urinary frequency, and had been treated by an osteopath without benefit.

On September 20, 1930, the day before his admission to the hospital, the patient was seen at his residence by Dr. Walter P. Bliss. His temperature was elevated; he was worried and a little flighty. On admission to the hospital, his temperature was 101.6°, pulse 100, and respiration 20 to 30. The urine was cloudy and contained pus cells and abundant phosphates. He had been nauseated and had vomited but there had been no abdominal pain. The skin was hot and moist. He was perspiring profusely and was restless, but in no pain.

The pupils reacted to light and in accommodation; ocular movements were normal; the sclera was injected. The nasal mucous membranes were congested. The throat was congested but without patches, the tongue coated. The general physical examination was negative.

On the following day the results of the blood examination were: erythrocytes, 4,630,000; hemoglobin, 73.9 percent; leucocytes, 8,800; small lymphocytes, 17; large lymphocytes, 11; large mononuclears, 3; neutrophils, 65; transitionals, 3; eosinophils, 1. The Widal test was negative. The blood

culture showed no growth after 96 hours.

On September 23d, the temperature was normal and the urine also normal. The patient was sent home on the following day, his probable diagnosis being influenza.

He was admitted to the hospital with a temperature of 100°, pulse 92, respiration 20, on October 2d. The next day his temperature was normal, and he was discharged on October 4th. X-ray films of the teeth and sinuses were negative, as was also the agglutination test for Malta fever. Again the blood culture was negative after 48 hours.

On October 9th, he had a high fever and chills and complained of pain in the left eye which had started the previous day. The pupil was active, there was ciliary injection, and the cornea appeared to be a little hazy. The tension (McLean) was 45 to 50 mm. Hg. There was no cupping of the nerve head, nor was the field contracted. Pilocarpine and eserine were prescribed, and tension in the eye began to subside until on October 13th it became normal. The pilocarpine therapy was not discontinued until the first of November.

On the supposition that the patient might be suffering from relapsing fever, though a blood smear was negative for spirochetes, he was given 0.3 mgm. of neo-arsphenamine intravenously. On October 27th he had another chill and the temperature rose to 103°. Blood smears at this time showed many *Spirochaeta recurrentis*, about one to every third field. The patient then recalled having been bitten behind the right ear on August 27th, while at Lake Tahoe. This bitten area had swelled to the size of a "cranberry," hard as a rock but not tender, had persisted for three or four days, and had then disappeared. Neo-arsphenamine was accordingly administered intravenously, 0.6 mgm.

On November 1, 1930, the patient was seen at the office. His tension in the

* Read before the Western Ophthalmological Society, Portland, Oregon, May 24, 1935.

left eye was 22 mm. Hg (McLean). Pilocarpine was discontinued and he was instructed to report in two days. He did not, however, return until February 26, 1931, when the eye was soft but the vitreous so full of floaters that the fundus could not be seen. Two days later the tension, O.S., measured 33 to 35 mm. Hg. Pilocarpine was prescribed. On March 4th, the left eye became painful. The tension was 30 mm. The anterior chamber was full of precipitates, the pupil small, but it dilated well under a mydriatic. Hot compresses were ordered. The patient suffered greatly from this fresh complication. It was difficult to keep the pupil dilated and prevent the formation of synechia, and on March 9th it was necessary to send him into the hospital again, where he remained for nine days undergoing vigorous treatment for the severe uveitis.

By the end of March the eye was almost white, the pupil oval, and vision had much improved. His tension, however was 38 to 40 mm. (McLean) so that it was necessary to resort again to the use of pilocarpine, night and morning.

On April 20, 1931, the vision in the left eye was 6/7—; the tension was normal to fingers, and the vitreous opacities were thinning out, but there was a large dense fusiform opacity in the lower part of the vitreous. Nearly four years later (March 16, 1935) the vision was O.D. 6/5 —3; O.S. 6/6. A few fine vitreous opacities were to be seen in the left eye. At the 11-o'clock position, a tag of pigment was seen to be attached by a fine filament to a pigment spot on the lens. The pupil was round and active; tension normal to the fingers.

Dr. M. N. Beigelman, a native of Russia, where relapsing fever is prevalent, writes in a personal communication to me, "The common ocular complication of relapsing fever, as observed in Russia during the epidemic of 1920-21, was a uveitis with vitreous opacities. The number of uveitis cases of this type seen in the Eye Hospital of the University of Don during those years was 800, constituting 5.3 percent

of the total number of eye patients in this period and 1.7 percent of all who had had relapsing fever. There was no record of acute glaucoma, although in several cases the uveitis resulted in complete seclusion of the pupil."

65 North Madison Avenue.

PHOTOGRAPHICALLY RECORDING THE PHORIAS

FORREST J. PINKERTON, M.D., F.A.C.S.

AND

THOMAS W. COWAN, B.S., M.D.

HONOLULU, HAWAII

It has been comparatively easy to get good pictures of strabismus cases before and after surgery or orthoptic training, with almost any type of camera. Attempts to photograph the phorias are more difficult, especially in patients with strong fusion power who fuse immediately when the screening element is taken from before one eye.

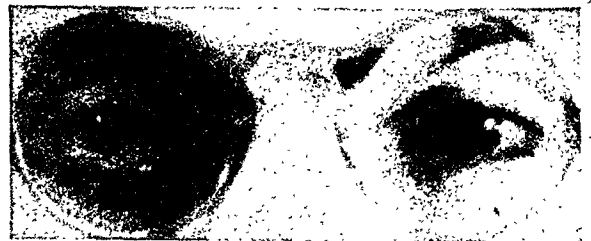


Fig. 1 (Pinkerton and Cowan). Photograph of exophoria.

The camera used here was one of the miniature type with a fast lens, but any camera for which infrared film is obtainable can be used. Illumination was secured by means of two Mazda Photo Flood bulbs, one placed three feet and the other twelve inches away, both at about an angle of 45 degrees from the patient. The infrared filter and film are made by the Leica Company.

The picture used for the illustration was taken at one meter and enlargements made. For detailed close work, a 5- or 6-inch telephoto lens may be used, but for amateur work this is not necessary. The photograph shows the exophoric eye behind a red glass. The red glass breaks up fusion and the eye assumes the position indicative of the phoria, yet the picture is possible because of the infrared film.

AN UNUSUAL VORTEX VEIN

FORREST J. PINKERTON, M.D., F.A.C.S.

AND

THOMAS W. COWAN, B.S., M.D.

HONOLULU, HAWAII

The vortex veins carry most of the venous blood from the iris and ciliary body and the whole of that from the choroid. Those vortices average 15.2 mm. in length and run very obliquely through the sclera in canals 4 to 5 mm. in length. Although variations do occur, usually by the doubling of one or more trunks, there are usually four such veins disposed almost symmetrically 90 degrees apart. The point of exit of the upper pair lies 7 mm. (nasal vein) and 8 mm. (temporal vein), and of the lower pair $5\frac{1}{2}$ and 6 mm. behind the equator, the two temporal veins being associated with the tendons of the oblique muscles.

The two superior vortex veins enter the superior orbital veins and the two inferiors the infraorbital vein. The superior orbital vein, the largest in the orbit, is formed in the upper and medial corners of the orbital margin by union of the supraorbital and angular vein of the face, and runs backward, leaving the orbital cavity by the superior orbital fissure, usually above the annulus of Zinn, to enter the anterior part of the cavernous sinus.

The inferior orbital vein begins as a venous network on the floor of the orbit, receiving branches from the lower-lid and lacrimal-sac regions, the inferior rectus and oblique muscles, and the inferior vortex veins. It divides into two main branches—an upper larger one which runs through the superior orbital fissure beneath the annulus of Zinn into the cavernous sinus, and a lower which runs through the inferior orbital fissure into the pterygoid plexus.

The unusual size, thickness, and the direction of the vortex vein to be described, together with the diagnostic possibilities it presented were important enough, it was thought, to furnish material for another unusual case report.

During a secondary strabismus operation on a young male it was necessary to locate the right external-rectus

muscle. Upon separating the conjunctiva and Tenon's capsule, a fairly flat, reddish, nonpulsating piece of tissue about 4 mm. thick was encountered, lying 7 mm. from the limbus, and about 3 mm. below the horizontal line. It was at about the position of the muscle which was sought, and an attempt was made to expose it better so that the muscle clamp could be applied. The resemblance of this tissue to muscle was

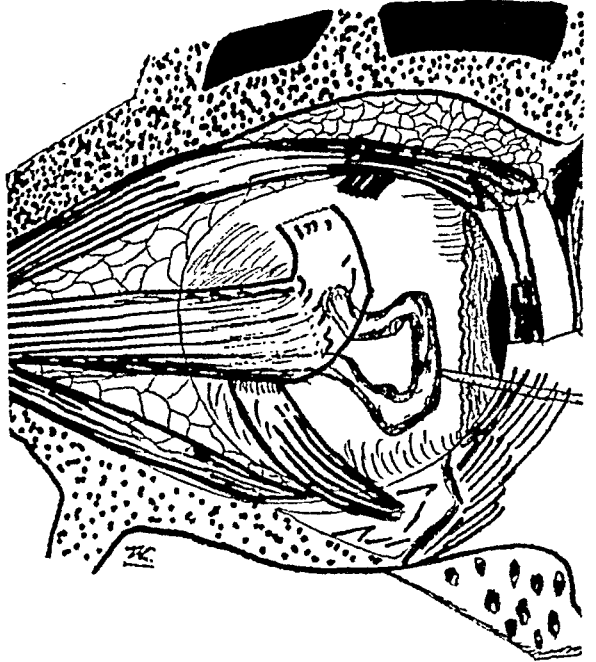


Fig. 1 (Pinkerton and Cowan). An unusual vortex vein.

enhanced by the fact that one could almost see muscle fibers. In uncovering more of this tissue it was noticed that instead of ending as a muscle stump it began to double back upon itself downward and backward.

At about this time the real muscle stump was found but even then the resemblance was so marked that this "foreign" tissue was suspected of being an anomalous inferior-oblique muscle.

Further dissection revealed a tortuous thick-walled vein running in the general direction as shown in the drawing. It was not advisable to explore this vein to its termination and the drawing shows in dotted lines its visualized course.

The drawing was made as the vein was pulled forward by means of a muscle hook.

A NEW CONJUNCTIVAL FLAP FOR TREPHINING OPERATIONS*

F. H. VERHOEFF, M.D.
BOSTON

Owing to the danger of sympathetic uveitis incident to iridotaxis, in cases of chronic glaucoma I have with increasing frequency resorted to trephining. For this operation during the past five years I have made use of a new type of conjunctival flap that possesses at least three important advantages over the usual flap. First, it provides better permanent drainage; second, it reduces

is, edema of the cornea in front of the fistula sometimes occurs.

The method of making the new flap is as follows: With a Graefe knife the conjunctiva is severed exactly along the limbus for a distance of about 4 mm. With forceps grasping the cut margin of the conjunctiva, the latter is undermined with knife or scissors close to the sclera sufficiently far back to permit exposure of the area to be trephined and also to permit the flap readily to be pulled down well over the cornea. The corneal surface is now denuded of epithelium for a distance of about 2 mm. in front of the selected site. With one needle of a double-armed black-silk suture (no. 1) a "bite" is taken in the cornea about 2 mm. long, parallel to and about 2 mm. from the limbus. Each needle is then passed through the conjunctival flap from beneath as indicated in the diagram (fig. 1). The two loops of suture are then placed on the sides out of the way. The sclera is trephined, iridectomy performed, and the operation completed by pulling the small conjunctival flap over the opening and tying the suture.

Following the operation, the anterior chamber is usually not re-formed for two or three days. The suture is allowed to remain for at least one week, preferably longer. As a rule, the bleb ultimately retracts to the limbus, but occasionally remains adherent for a short distance in front of it. In no case in which a previous operation had not been performed has the flap retracted so as to expose the fistula. In two cases, however, in which the conjunctiva was cicatrized as the result of previous operations, I evidently failed to dissect the flaps sufficiently and when the sutures were removed the fistulae became exposed. By covering the fistula with a large Van Lint flap I obtained a successful result in each of these cases.

243 Charles Street.

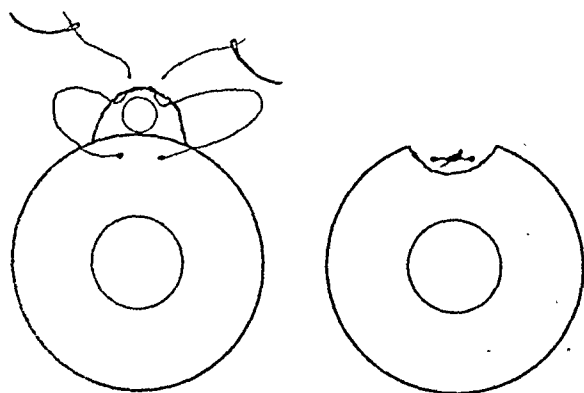


Fig. 1

Fig. 2

Fig. 1 (Verhoeff). A new conjunctival flap for trephining operations.

Fig. 2 (Verhoeff). Showing the completed operation.

the tendency to the formation of a vesicular "bleb"; and third, it greatly simplifies the entire operation. In preparing the usual conjunctival flap, the conjunctiva is dissected up freely around and behind the site for the fistula. As a result, the conjunctiva often becomes firmly fused with the sclera, filtration thus suffers interference, and leads to a marked vesicular condition and danger of late infection. Moreover, when the cornea is split, as it usually

* From the Massachusetts Eye and Ear Infirmary.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

January 24, 1935

Dr. J. Milton Griscom, chairman

The history of the operative treatment of detachment of the retina

Dr. William Zentmayer said that the germ of all the present procedures might be found in the early literature of ophthalmology. As early as in 1857, Graefe performed puncture of the retina and in 1860, Kittle introduced scleral puncture. Wolfe later increased the puncture to an incision 8 to 12 mm. long. In 1889, Schoeler injected tincture of iodine in the preretinal spaces, between the retina and the vitreous. In 1893, Schoeler and Abadie independently sought by electrolysis to stimulate intraocular metabolism and thus cause absorption of the subretinal fluid, and at the same time produce a reactive chorioretinitis.

In 1877, McKeown excised a piece of the sclera and in 1879, Higgins employed a trephine for this purpose. In 1888, Gaupillar performed superficial cauterization. In 1903, Müller introduced the removal of an elliptical section of the sclera from the lateral wall of the eyeball, closing the wound by a number of horizontally placed sutures. He considered the special indication for this operation a high myopia where the detachment was of long standing, and usually total. Török and Heed had reported on the same operation.

In 1895, Deutschmann introduced his much-used procedure of retinovitreal transfixion and later also employed the injection of the vitreous of rabbits into the human vitreous chamber.

In 1910, Bettremieux introduced the removal of the superficial layers of the sclera tangential to the upper limbus of the cornea over an area 10 x 2 mm. The principle underlying this was to aid in the return of the blood from the eye by securing anastomosis between the deep-

lying vessels of the sclera and those of the conjunctiva.

In 1917, Verhoeff employed electrolysis, introducing a cathode into the eye and placing the anode on the cheek. He used a large number of small half-curved needles which were passed through the conjunctiva and the coats of the eyeball until their tips appeared in the vitreous chamber.

In 1919, Gonin employed perforating thermocauterization, and in 1930, published the results of 250 cases. (He stated that definite cures can be obtained in about 60 percent of recent cases, this percentage decreasing with the age of the attachment.) In 1930, Guist placed a number of trephine holes to demarcate the separated from the attached portion of the retina by a cicatricial band, the thin remaining layer of the sclera being scraped away and the choroid touched through each of the holes with potassium hydrate. In the same year Larson and Weve developed a new method of diathermy in which a small negative electrode is applied to the sclera, the positive electrode being applied to some other part of the body. The object was to produce an adhesive coagulation that would reattach the retina. Weve later perfected a micro-puncture method of electrolysis. Safar modified the diathermy procedure by using small tacks either singly or in groups. These are laid down in a curved line about the tear, employing a milliamperage sufficient to permit the needle to be implanted in the tissues by gentle pressure. In 1934, Vogt returned to the method of Verhoeff, introducing a cathode needle into the vitreous and placing the anode on the eyeball. A needle such as is employed in removing cilia by electrolysis is used. Dozens of momentary perforations can be made without damage. It differs from the Verhoeff procedure principally in that an attempt is made to place the punctures about the tear in the retina, when found. In 1934, Langdon reported the use of the thermophore in a case of retinal detachment, with successful result.

Microscopic pathology of retinal detachment

Dr. Perce DeLong read a paper on this subject. He said that traumatic detachment of the retina is more responsive to both medication and surgical treatment; but it should always be remembered that any retinal detachment is the expression of an irritation, whether it be caused by trauma, solar light, electricity, toxin, metabolic changes, insidious inflammation, a chronic irritation, or vascular changes. Cauterization of the choroid and retina with reattachment of the retina might temporarily alleviate the symptoms, but not in every case did it remove the cause and cure the disease.

Certain factors in the physiology, ophthalmoscopy, and microscopy of the reattached retina

Dr. Edmund B. Spaeth read a paper on this subject.

A. G. Fewell,
Clerk.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

February, 1935

Dr. J. Milton Griscom, chairman

Convergent concomitant strabismus of paralytic origin

Dr. Warren S. Reese thought that this case might be of interest in that it illustrated the fact that a concomitant strabismus might result from a muscle palsy. The patient first appeared at the Pennsylvania Hospital in October, 1931, at which time his external examination was negative. In February, 1932, he returned complaining of double vision. He then had a paralysis of the right externus, being unable to abduct the eye beyond the mid line. During the next several months abduction gradually improved but he continued to have strabismus. He now showed a convergence of about 20 degrees, the right eye deviating. On right lateral rotation he fixated with the right eye and with left lateral rotation with the left eye, fixation changing about 15 degrees beyond the mid line. The ocular movements in

all directions were quite good. His subjective tests were unsatisfactory, for he did not understand English well. Vision was 6/6 in the right eye and 6/6 plus in the left eye. With the cover test, the right eye showed a greater deviation than the left eye and both eyes showed less deviation on looking to the right than on looking to the left. It would seem, therefore, that the case should now be regarded as one of spasm of the right internus rather than of paralysis of that muscle. These cases are said to be due to contracture of the antagonist muscle (in this patient the right internus) so that when the paralysis disappears this contracture is too great to be overcome and a concomitant strabismus results.

Discussion. Dr. William Zentmayer said that what had occurred in Dr. Reese's interesting case was probably what occurred in most cases of acquired palsy of an ocular muscle when recovery was delayed or did not take place, and explained the fact that in such instances diplopia was lost. Probably the spasm first affected the synergic muscle and later the antagonistic. For instance, in a case of paralysis of the superior-rectus muscle the synergic muscle, the inferior oblique, is first affected and for a time gives the symptoms of bilateral paralysis of the superior-rectus muscle. Later a spasm of the inferior rectus occurs.

Bilateral retinoblastoma treated by radiation

Drs. A. G. Fewell and W. E. Fry reported the case of a male child, aged 21 months. With oblique illumination the vitreous chamber of the right eye was seen to be filled with a yellowish-white nodular mass over which passed tortuous and somewhat dilated vessels. The left eye on ophthalmoscopic examination showed a fluffy white area about three disc diameters in size, with irregular margins and an elevation of about twelve diopters. The diagnosis was bilateral retinal glioma, and the right eye was removed. No masses were found in the orbit. The left eye was treated with X-ray therapy, over a period of a year, by the saturation method. The lens showed no opacities at any time, and the intraocular structures could be

easily observed. There was a marked reduction in size of the initial lesion after the first two radiations; by January 6, 1934, however, the vitreous cavity was nearly filled with tumorous masses. Enucleation was advised, and permitted on March 12, 1934. The child was last seen in July, 1934, at which time weight and development were normal. Pathological examination showed retinoblastoma in each eye. In the eye which had received the radiation, marked degenerative changes were noted; it was believed that they were produced by the X-ray treatments.

Retinoblastoma

Dr. C. E. G. Shannon presented a case of retinoblastoma, in the left eye of a baby boy, 18 months of age.

Discussion. Dr. J. Robert Andrews said he thought we should take into consideration the radiosensitivity of the various structures of the eye in the discussion of these two papers. In general, the eyelids and conjunctiva are more sensitive than cutaneous structures. Next in the order of sensitivity are the cornea, iris, and ciliary body. Irradiation of these structures may result in conjunctivitis, keratitis, and uveitis. The crystalline lens occupies a peculiar position in view of the fact that lenticular opacities may result from the effect of protracted irradiation although there may be no permanent damage to any of the other ocular structures. The retina of an adult eye can almost never be affected by doses of external irradiation which do not exceed the tolerance of the cutaneous and other structures which lie between the source of radiation and the retina itself. Many diseases of the eyelids and conjunctiva that are amenable to irradiation are not treated by these methods because of the great, and justifiable, respect in which the eye is held by radiologists. This may account, in part, for the rarity of reports of ocular damage due to excessive irradiation.

The English are attacking this problem by introducing radium needles directly into the sclera at the site of the tumor. Gold radon seeds would probably be preferable to radium needles as they could be left permanently in place.

External irradiation could then be employed to build up the total dose of irradiation to such an amount as would be adequate to affect the tumor. Such a policy in the management of these cases requires the greatest coöperation between the radiologist and the ophthalmologist.

It is difficult to speak of the value of postoperative irradiation of the orbits of these patients because there is no method by which the results can be evaluated. He was inclined to the belief that it was of little value and that if there were no recurrence, the surgery had been adequate, but that if there were a recurrence, in spite of postoperative irradiation, then the surgery had not been adequate. While irradiation alone had not proved eminently successful, in the treatment of cases in which the disease could not be eradicated with complete certainty by surgery alone, irradiation might ultimately prove its value.

Dr. William Zentmayer mentioned a case of bilateral glioma in which one eye had been enucleated and a radon seed had been implanted in the remaining eye. When the child was last seen by him the enormously enlarged retinal vessels were somewhat reduced in size and the growth showed numerous lustrous areas, probably indicating cellular change.

In October, 1934, Dr. Palmer of Miami, Florida, who had referred the case to him, reported that the vessels and the growth both appeared to be smaller and that the child's vision had improved.

A comparison of tonometers for their clinical accuracy

Drs. Francis H. Adler, George E. Berner, and George P. Meyer carried out the following investigation: 1. To devise an instrument for the testing of tonometers. 2. To compare the readings of different tonometers with actual intraocular pressures. 3. To compare the readings of standard tonometers of the same make at different pressures. 4. To determine factors which cause variations in readings.

The results were: 1. The test instrument was essentially an inclined mer-

cury manometer capable of delicate adjustment, from which pressure was transmitted to an enucleated cat's eye through a needle in the eye connected to the manometer with pressure tubing filled with normal salt solution. The eye, with the cornea vertical, was supported in a brass ring. The tonometer was held in a clamp at the end of a rod which was fastened to the tube of a microscope, so the tonometer could be raised and lowered by operating the coarse adjustment of the microscope.

2. Schiötz, McLean, and Gradle tonometers were found to be sufficiently accurate for clinical purposes. Between the pressures of 20 and 40 mm. of mercury there was rarely a difference of more than 4 mm. between the actual pressure and the tonometer reading. One Bailliart tonometer was tested and found entirely inaccurate. McLean readings between 20 and 30 mm. were 3 mm. higher than Schiötz and between 30 and 40 mm. were 4 mm. higher than Schiötz.

3. Four Schiötz instruments were taken at random and compared. Between 20 and 30 mm. there was no more than 3 mm. difference in reading. At higher pressures greater inaccuracies developed, but the inaccuracy was constant for the particular instrument and when known could be allowed for in the readings.

4. For accurate readings, the plunger of the tonometer must be absolutely clean, the foot plate must rest smoothly on the cornea approximately on the center and the tilt of the instrument must not be more than 15 degrees. Weights for the Schiötz instrument should be selected so that the pointer reads between 3 and 7.

A. G. Fewell,
Clerk.

COLORADO OPHTHALMOLOGICAL SOCIETY

April 20, 1935

Dr. J. M. Shields, president.

Chronic iridocyclitis after needling

Dr. W. H. Crisp presented a man, aged 60 years, who had had cataract extractions in each eye by other physicians. A hemorrhage had occurred five

days after the operation on the left eye, and a secondary needling in the right eye had been followed by persistent ciliary injection with some pain and decided loss of vision. The tension was sometimes as high as 35 mm. (Schiötz), and did not vary greatly whether atropine or pilocarpine was used. There were many cells in the anterior chamber and on Descemet's membrane. Examinations as to possible sources of focal infection were negative. The vision of either eye with correction was limited to about 5/30, and the vision of the right eye, which had been the more useful eye, was gradually getting worse.

Discussion. Dr. M. E. Marcove recommended that a cyclodialysis be performed.

Dr. E. M. Reynolds reported that when the patient was seen at Colorado General Hospital, early in January, his vision had dropped from 20/40 to 20/200. A secondary membrane was clearly visible and the eye showed no sign of inflammation.

Dr. W. M. Bane suggested that the needling was perhaps just an incident in the development of a cyclitis which had probably been developing for some time prior to operation.

Dr. Charles Walker, Jr., said that he had seen several cases of a similar nature which cleared up after numerous Reese incisions.

Retinal hemorrhages in a juvenile diabetic

Dr. R. W. Danielson presented a 25-year-old medical student who had had diabetes for many years and whose case was reported in the American Journal of Ophthalmology, 1932, v. 15, p. 1181. Recently the patient had been observed by Dr. Henry W. Wagener of the Mayo Clinic who noted the tiny hemorrhages and their close relationship to the venules. Dr. Wagener also believed that a retinal arteriosclerosis was present. His blood pressure was now measuring about 150/95 and his urine was showing some albumin. He remained sugar-free on 60 units of insulin a day. The patient had in the last few years been careless about the care of his diabetes. A month before presentation he had appeared at the office for a periodic

examination and had shown a shower of tiny, round hemorrhages, most of them in the perimacular region. Since then he had taken much better care of himself and when presented only one or two hemorrhages could be found in each fundus. No white infiltrates nor exudates had ever been seen in either eye.

Dr. Danielson called attention to the fact that these small round hemorrhages were rather characteristic of diabetes. He also stressed the fact that ordinarily a retina did not show changes in diabetes, nephritis, or any other condition until the condition had lasted long enough to affect the vascular system and, therefore, young people usually did not have fundus pathology.

Discussion. Dr. Whitney Porter said that it was unusual to find diabetic hemorrhages in new cases of diabetes. In cases which he observed at Iowa City, changes in the vessels were evident in old cases of five years' or more standing.

Dr. J. C. Strong reported a case in which there were numerous flame-shaped hemorrhages in both fundi. An internist made a diagnosis of diabetic retinitis which was challenged by an oculist because of the appearance of the fundi. He also reported a case of diabetes which had improved markedly on a diet including soy-bean bread, without insulin.

Dr. Charles Walker, Sr., remarked that since the use of insulin he had not seen any of the large, severe hemorrhages which used to occur in diabetics.

Dr. J. M. Shields said that his impression had always been that the shape of a retinal hemorrhage depended entirely upon its location in the retina.

Posterior capsular cataract

Dr. R. W. Danielson presented Miss McN., 32 years old, who at the age of 17 had noticed floaters in her right eye. At that time she had been given potassium iodide and sweat baths and had had a tooth removed. One year later she developed a hemorrhage in the right eye and had an appendectomy at that time. A few years later she had spent a few months in a sanatorium as a tuberculosis suspect because of general asthenia and a positive family history.

There had been no further hemorrhages in the eye.

The patient had come in recently complaining of poor vision of the right eye, diplopia for large objects, and divergence. On examination one found a right divergent strabismus varying from 5 degrees to 20 degrees. There was a definite, flaky, widespread, posterior-capsular cataract. The fundus showed various areas of retinitis proliferans, the most marked band going nasally from the disc. From this same area on the disc there proceeded forward apparently to the lens, a dark, wavy, black band that looked like a persistent canal of Cloquet. No fine vitreous floaters were discernible. The vision was 20/200. The left eye was normal in appearance and vision.

Dr. Danielson asked whether one would be justified in doing a needling of the lens or an operation to straighten the eye. He remembered having shown before the Society another case of retinitis proliferans and an apparent persistent canal of Cloquet in the same eye and wondered whether such eyes were more apt to have hemorrhages. Would the eye be liable to further hemorrhages if needled and would the eye be more likely to remain straight?

Discussion. Dr. W. H. Crisp expressed the opinion that the band extending forward to the lens was probably scar tissue from the hemorrhage, rather than a persistent canal of Cloquet. He did not recommend any operative procedure to correct the squint whereas others did advise a strabismus operation for cosmetic reasons.

Edna M. Reynolds,
Secretary.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

May 10, 1935

Dr. J. S. Reynolds, president

Sound and hearing

Professor Henry Hartig, of the Department of Electrical Engineering at the University of Minnesota, gave a talk on this subject.

Nonsurgical reattachment of iris in a case of traumatic iridodialysis

Dr. V. J. Schwartz (Minneapolis) reported the case of a boy, aged 13 years, who on July 4, 1929, suffered an injury to his left eye. An iridodialysis of about 6 to 7 mm. in length developed above. Atropine was instilled within two hours of the accident. The pupil dilated and the torn periphery of the iris became reattached to the ciliary body. This had remained so since.

The author knew of only one other similar instance, although it was possible there might be more. Almost all authorities regarded such a reattachment as impossible.

Discussion. Dr. C. N. Spratt (Minneapolis) stated that, in spite of the frequency of automobile accidents, iridodialysis was not a common condition. He said he had seen a large number of cases in which separation of the iris had been made intentionally following the method of operation for glaucoma in which he had combined iridodialysis with the Lagrange operation. Out of some 75 cases, five or six reattachments of the iris had taken place.

Dr. Schwartz (in closing) said he knew that Dr. Spratt performed iridodialyses in his Lagrange operations, but these were very small. A tear of 2 or 3 mm. was quite a different thing from one of 7 mm. and it was easy to understand how the small one might heal.

Unusual cataract complication, 40 years after operation

Dr. V. J. Schwartz presented a man who was born with congenital cataracts 48 years ago. The right eye had been enucleated in childhood. The left eye was successfully needled 40 years ago, vision with a lens being 20/30.

About six weeks ago a crescentic piece of lens capsule prolapsed through the pupil. The temporal end was apparently still attached to the zonule behind the iris. The nasal end of this membrane was lying free at the bottom of the anterior chamber, yet through a small elliptical aperture beneath this membrane the patient could still see 20/30.

Prosthesis worn over an infantile eye for 25 years

Dr. H. O. Cooperman (Minneapolis) reported the case of D. M., aged 40 years, who complained of a thick discharge, of two months' duration, from the left eye socket. He stated his mother had told him that when he was nine months old he could not open his eyes and the local physician in a small Russian village had enucleated the left eye in order to save his right eye. At the age of 15 years, he began to wear an artificial eye.

The orbit was well developed. Beginning at the lid margin, in the superior nasal angle, a flat elevated inflamed mass of tissue, about 5 mm. wide and 12 mm. long, extending backward and inward, was distinctly visible. In the orbit lay a small shrunken globe, scleral white in color, with an irregularly shaped bluish discoloration in the center of a linear scar extending across the globe. The shrunken globe followed the right eye in movement.

A microscopic section of the growth showed thickening of the epithelium, diffuse lymphocytic infiltration, many blood vessels and fibrous tissue. The diagnosis was chronic inflammation. There was no evidence of malignancy.

This condition was of interest because it was rare, because the bony orbit had developed while the eye remained infantile, and because of the length of time during which the infantile eye had been covered by an artificial eye without any ill effects to it or to the normal eye.

Walter E. Camp,
Secretary.

ROYAL SOCIETY OF MEDICINE, LONDON

Section on Ophthalmology

June 14, 1935

Mr. Ransom Pickard, president
Bilateral conical cornea; contact-glass correction

Mr. A. Rugg-Gunn showed a man from South Africa, aged 22 years, whose eyes had been affected since he was 12 years old. More than four years ago his right vision was 4/60, left about 1/60. Last February, the vision had been

O.D. 2/60, O.S. 1/60. With appropriate contact glasses the vision was O.D. 6/12, O.S. 6/18. Within a fortnight of receiving his contact glasses the patient was wearing them continuously for four hours, and in four or five weeks was wearing them eight or nine hours a day.

Discussion. Mr. J. Gray Clegg said that recently, in company with members of the North of England Ophthalmological Society, he saw in Budapest, a demonstration of the method of Dallos. By molds each glass was individually formed for the eye. The contact glass was tight in one direction, and fitted loosely in another, so as to allow of movements of the globe. Patients were shown who wore their glasses from morning till night, and some of them had high myopia.

Mr. A. G. Paling suggested the need for tinted contact glasses in some cases.

Mr. Rugg-Gunn said that in all Dallos's work the optical glass was ground; in the early part of his work Dallos did try blown glass, but had discarded this method long ago. As to the time of wearing the glasses, Mr. Rugg-Gunn always advised patients to take them off at the end of four hours, at the most, and usually he found that meal-times were chosen for this. Three 4-hour periods of wearing usually sufficed to carry the patient through the day.

A type of congenital optic atrophy differing from Leber's disease

Mr. G. T. Willoughby and Dr. A. Hugh Thompson stated that this condition differed from Leber's disease in the following particulars: (1) in Leber's disease the age of onset was about 20 years, and all these cases were congenital; (2) out of eleven cases in four generations, five were males, six females; Nettleship's figures for Leber's disease were 300 males and 60 females; (3) inheritance was always through the affected mother, never through an unaffected mother or through the father; in typical Leber's disease it was through an unaffected mother; (4) the condition appeared to be stationary after birth; in Leber's disease the prognosis was not so grave; of the 18 known

members of this pedigree, seven were not affected, eight were blind, and three had some useful vision with some stationary contraction of the fields; (5) in nearly all the cases seen, the discs were of a pearly whiteness. This was so, even in the case of those who had some useful vision; (6) in spite of a central scotoma, as in Leber's disease, there was a concentric contraction of the fields; (7) in all the cases in this family that had been examined, nystagmus, though not necessarily constant, had been present. Except for the optic atrophy and narrowing of vessels in some cases, no other ophthalmoscopic changes were present; (8) in the affected members, no other congenital anomalies had been noted. There were no known congenital abnormalities in relatives. (9) There was no consanguinity.

The use of adrenaline in atropine and hyoscine irritation

Mr. Eugene Wolff said that most ophthalmic surgeons had had cases in which the use of a mydriatic was imperative, and yet atropine, hyoscine, Duboisin, etc., all caused irritation. Many suggestions had been made with a view to overcoming this. Sometimes changing the supply of the drug by obtaining it from a different chemist might be successful. Waller had recently shown that it was possible to immunize patients against atropine irritation by injecting, subcutaneously and repeatedly, a combination of atropine and protein in the form of tears. But it might take some weeks for this to have effect, and in the interval it might be necessary to continue the use of the mydriatic. A simple expedient proved to be helpful in the following case: A patient who had had a discission after a cataract extraction, suffered from atropine and hyoscine irritation: the skin of the lids was dry, red, and swollen. Adrenalin was dropped into the conjunctival sac and on the skin of the lids. Zinc-oxide cream was applied to the lids, and then hyoscine was instilled. On the next day the skin was found to be practically normal. By this means hyoscine was continued for a week without trouble.

(Reported by H. Dickinson).

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis

WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver

EDWARD JACKSON, Consulting Editor
Republic Building, Denver

HANS BARKAN
Stanford University Hospital, San Francisco

HARRY S. GRADLE
58 East Washington Street, Chicago

EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis

PARK LEWIS
454 Franklin Street, Buffalo

C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City

M. URIBE TRONCOSO
350 West 85th Street, New York

JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York

Address original papers, other scientific communications including correspondence, also books for review, and reports of society proceedings to Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.

Exchange copies of medical journals should be sent to Dr. William H. Crisp, 530 Metropolitan Building, Denver.

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis. Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Authors' proofs should be corrected and returned within forty-eight hours to the manuscript editor. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip. Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

REFRACTION IN EUROPE AND AMERICA

Visiting European clinics, many American ophthalmologists have reluctantly gathered an impression that refraction on the European continent (as distinguished from the British Isles) was usually on a much lower plane than in the United States.

The old prejudice against the wearing of glasses, except in case of extreme necessity, is still much more prevalent on the eastern side of the Atlantic. In many cases of convergent strabismus associated with hyperopia no attempt is made at the wearing of a refractive correction. Patients with important amounts of myopia quite commonly wear glasses only for brief intervals, and many such patients do all close work without glasses. Even after recognition of important fractions of astigmatism, such as in the United States would be regarded as productive of eye-strain, it appears a frequent practice to

prescribe only a spherical correction, ignoring the cylindrical.

Economic circumstances are of course partly, although by no means wholly, responsible for this neglect of the art of refraction. Fewer citizens of continental Europe can afford to pay for painstaking work on the part of the refractionist. The low esteem in which the prescription of glasses has been held in one European country at least is indicated by the fact that seven years after the end of the World War the customary fee for this service in important provincial cities of the German Reich was stated to be six marks (at that time equivalent to a dollar and a half)!

In a recent issue of a German eye journal (*Zeitschrift für Augenheilkunde*, 1935, volume 87, page 37), Max Herzog, who has evidently spent some time in the office of a well-known American ophthalmologist, gives a fairly detailed account of American refractive technique as he has seen it.

He credits this country with extraordinary precision in refractive method, such as perhaps appears exaggerated to Europeans. This he explains as attributable to the conditions of American life, with its general restlessness, strenuous competition, and the spirit of rivalry, with consequent general nervousness and its reactions on various bodily functions. Americans, he says, are distressed at the thought that any organ is not working at 100-percent efficiency. The possession of full visual acuity has a much greater significance for them than for Europeans. In other words they are "eye-conscious."

Customary procedures which Herzog describes include the fogging method, the use of astigmatic charts or the cross cylinder, homatropine cycloplegia for adults and atropine cycloplegia for young children, retinoscopy under cycloplegia (Lindner's cylinder skiascopy being highly esteemed), a postcycloplegic test, and subsequent control as to the correctness of the glasses furnished by the optician to the patient. Some attention is given by the author to the part played in the United States by the optometrist—a calling which Herzog says does not exist in Germany.

As to the ordering of glasses, the author comments on the fact that for hyperopia distance glasses are ordered more frequently than in Europe. Unilateral amblyopia is also more generally corrected. Herzog also notes the importance attached to correction of even slight amounts of astigmatism, especially against the rule, when any sort of related symptoms are present. Another fact particularly mentioned is that in the United States it is customary to correct the full amount of astigmatism measured, even in high errors, such corrections being usually well tolerated.

Most of us on this side of the ocean will approve Herzog's statement as to the demonstration by experience that particularly the correction of low astigmatic errors gives relief from asthenopic symptoms. Perhaps the failure of the European ophthalmologist to obtain similar results, and the impression of our European colleagues that the good effect in these cases is simply due to suggestion, depend upon European

lack of refinement in refraction rather than upon the nerve tension, the "eye-consciousness," and the suggestibility which our European friends are disposed to attribute to the typical American patient.

W. H. Crisp.

ADAPTATION AND PHOTO-PHOBIA

On sudden exposure to bright light, the pupil quickly contracts. This is a light reflex—the reaction by which we test the sensitivity of the retina, to find if an eye will be benefited by removal of a cataract. It occurs very quickly, and adapts the eye to light by shutting out most of the light that would be concentrated on a certain part of the retina. On passing into complete darkness the pupil swiftly dilates, and reaches its maximum size in a few seconds. This is the pupillary mechanism of adaptation, which varies considerably in different animals.

Apparently present in all animals that have good sight, there is also a nervous mechanism of adaptation that adjusts the sensitivity of the eye to secure the best vision in any particular brightness of light to which the eye is exposed. This "retinal adaptation" is a much slower process. Many observers, by careful laboratory experiments, have measured the time required for dark adaptation; the time it takes for the retina to reach its highest degree of sensitivity in comparative or complete darkness. The complete adaptation of the eye to darkness is a slow process. All observers agree that it takes from one to two hours to reach the maximum retinal sensitivity for feeble illumination.

Adaptation of the retina to maximum illumination has not been so studied; and probably cannot be studied by the same exact methods of the laboratory. But, observed by the usual methods of personal comfort and visual efficiency, retinal light adaptation is also a relatively slow process, as compared with pupillary adaptation. The flashlight, for taking an instantaneous photograph, is unpleasant to those who are facing it. The sensation from a bright electric

lamp, suddenly turned on in a dark room, is not agreeable. A flickering light, varying much in brightness from instant to instant, is very unpleasant and unfavorable for visual efficiency. We see better and more easily by a steady light than by one that is variable, even though it may be, intermittently, much brighter. It is the steadiness of the light from the incandescent filament that makes it superior to the flickering arc lamp, or to the light of a leaping flame.

We must conclude that retinal, or neural, adaptation to light is a slow process, originally evolved to meet the slow changes of dawn and twilight. The beginning of dawn may be seen in the east an hour before sunrise and twilight lingers in the west an hour after the sun sets. So gradual is the change that we cannot fix the time when it begins or ends, and at no time is vision interrupted, or made a source of discomfort. So gradual is this change of light, so perfectly adapted to it are our visual processes, that it can go on day after day without attracting attention from the various things in which we are engaged. It may be a source of danger when one starts to read something in a fading light or tries to complete a piece of fine work before the light is gone. It is effective for preventing unnecessary interruptions by natural changes in illumination. But it tends to mask the reduction of light to a level that is insufficient for the best vision.

The safeguard against excessive light, or any sudden increase of light above that for which the eye is adapted, is photophobia, a disagreeable sensation produced by light stronger than that for which the eye is adapted. When adapted to complete darkness the flashing on of a 100-watt lamp may be disagreeable, but when the eyes have been adapted by watching the dawn, we can look steadily at the sun gradually coming up, without any unpleasant sensation; and many have watched the sun set, with eyes adapted to daylight, with feelings of enjoyment. It is not the brightness of a light, but the suddenness of its being made bright, that is disagreeable.

But in the dictionary, phobia is defined as "a morbid fear or dread." Photophobia, the dread of light, may easily become morbid. The mechanism of light adaptation has not been thoroughly studied, and is not fully understood. Many conditions may contribute to photophobia. Eye fatigue, poor nutrition, as by anemia, inflammation within the eyeball, may all produce, or increase, the dread of light. But the most common cause, and the cause of the cases of pathological photophobia, is avoidance of exposure of the eyes to normal daylight. Photophobia is a weakness of the power of light adaptation. It may be compared to loss of muscular strength by lack of exercise. The processes of nutrition are closely parallel in nerve cells and muscle cells, and the development of muscle strength and associated nerve strength, by regular and graduated exercise, is well understood by the trainers of race horses, base-ball teams, or prize-fighters.

The development of retinal, or neural, light adaptation must be carried on in the same way, and over equally long periods. Not for a few days, or intermittently, or without effort on the part of the patient, but daily, earnestly, persistently for months, or years, until light adaptation to strong daylight becomes one of the habits of life.

Edward Jackson.

THE ST. LOUIS MEETING OF THE SOUTHERN MEDICAL ASSOCIATION

On Sunday, November 17th, the largest group ever to attend a convention of the Southern Medical Association began to arrive. Almost four thousand names were registered. Following a succession of rainy days, the weather cleared on Tuesday and remained fair throughout the session.

On Monday, the American Board of Ophthalmology examined forty-five candidates at the McMillan Hospital and the Oscar Johnson Institute. As we have commented previously in the Journal, each year the candidates present themselves better prepared than in

the foregoing year. This is especially true of the young men and women and suggests that better opportunities for training are being offered by the ophthalmic institutes of this country.

A unique feature of the program was "St. Louis Day." Tuesday was so designated and on this day all sections were given over to local physicians. The Eye, Ear, Nose, and Throat Section program was divided equally between eye and ear, nose and throat, and also equally between Washington University and St. Louis University. Although possibly writing from a prejudiced viewpoint, the editor considers the discussions to have been well worth while. The departmental heads had urged that at least a part of the day be spent in the various institutions where demonstrations of the actual work being done could have been given; for it is obviously impossible to present this as clearly and interestingly in a lecture as when surrounded by the apparatus used and the subjects of the experiments. The directors of the Association, however, preferred the didactic method, and so there was nothing except the personnel of the speakers that characterized the performance as typical of St. Louis. Nevertheless, presentations were a little different from the usual run of convention papers and perhaps a little more profitable.

As to the routine section program, the editor has expressed himself on this subject before. The caliber of the papers was good, but it is not possible to do more than to scratch the surface of any but the simplest subjects in twenty minutes. Of especial importance and exceedingly valuable was the talk on plastic surgery by Dr. John M. Wheeler, the honor guest of the Section. It was a splendid lecture, clear, concise, instructive, and beautifully illustrated. The speaker was allowed an hour, which went by far too quickly.

So-called round-table sessions were held on Wednesday and Thursday afternoons. The editor heard only the ophthalmological program and thought it excellent. The name seemed somewhat of a misnomer, for the meeting was held in a convention hall. We re-

gretted this, as we like the idea of a luncheon followed by a table talk. There is a pleasing informality about it, and usually an open and unrecorded discussion that develops interesting points and permits a better acquaintance with the speaker. This session should be leisurely, but not too long; just a minor attempt to combat the present-day obsession to cram forty-eight strenuous hours into every twenty-four, productive chiefly of high blood pressure.

The meeting closed officially on Friday at noon. However, there were laboratory and surgical demonstrations on that afternoon for those who chose to remain a few hours longer.

The next meeting place will be Baltimore, which should be very attractive to ophthalmologists because of the Wilmer Institute in that city. It is hoped that the arrangement committee will authorize that a part of the ophthalmological program be held in that famous institute.

Dr. Fred M. Hodges of Richmond was elected president and Dr. Quitman U. Newell of St. Louis, vice-president. We may look forward to a splendid gathering next year.

Lawrence T. Post.

BOOK NOTICES

An outline of ophthalmology. By Sanford R. Gifford. Paper binding, 84 pages, 105 illustrations (half tones and etchings). Published by Edwards Brothers, Inc., Ann Arbor, Michigan. Price \$1.50.

This is a paper-covered photostatic copy from typewritten sheets of lectures for medical students in ophthalmology. The subject is very well covered, being obviously the product of much thought. The figures are instructive and well chosen. It is just the right thing for undergraduate teaching of ophthalmology and would adequately provide a course of fifteen lectures. The simple composition permits its sale for a reasonable price so that it could be purchased by every student. From it the

relationship of ophthalmology to general medicine can easily be stressed, thus fulfilling the function generally considered desirable for undergraduate ophthalmological teaching. We are indebted to the author for a most convenient handbook.

Lawrence T. Post.

CORRESPONDENCE

The action of Levo-glaucon

Editor, American Journal of Ophthalmology:

Inadvertently, a mistake was made

in the paper entitled "The lid-closure reflex of the pupil," written by Dr. Benjamin Boshes and me, and published in the November, 1935, issue of the Journal.

The first sentence on page 1049 should have read: "Levo-glaucon, a German preparation of histamine, acts directly on the muscle fibers, causing a maximal dilation of the pupil."

Will you be kind enough to call attention to this mistake in your next issue?

(Signed) Leo L. Mayer.

November 25, 1935

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy and embryology

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Motolese, A., and Jablonski, W. Relations between ophthalmology and experimental psychology. *Boll. d'Ocul.*, 1935, v. 14, March, pp. 317-327.

The "form theory" is the basis for a dissertation on phenomena which are evolved in the central nervous system in connection with ocular functions. The new theories are in marked contrast to the traditional doctrines of the classic school led by Helmholtz. (Bibliography, 14 figures.)

M. Lombardo.

Pfimlin, R., and Strübin, F. Investigations on the process of binocular vision. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 223. (Ill.)

For determining the direction of the visual axes in binocular vision the prism diopter has been taken as a general unit, that is a 1-cm. deviation of the ray by a prism from the original direction at a distance of 100 cm. The mode of calculation for distances less than 100 cm. is explained and the formula given. The experiments demonstrated that total vergence is the sum of two components, called accommodative and fusional vergence. The amount of these depends upon the effort of accommodation and the connection can be graphically represented. A standard curve for different refractions was established.

C. Zimmermann.

Pflugk, Albert. The problem of accommodation. Remarks on the articles of Nicolai and Strebel. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 369.

Pflugk criticizes Nicolai's theory (see *Amer. Jour. Ophth.*, 1935, v. 18, p. 980) and welcomes Strebel's acceptance of his experimental proof of tension of the zonular fibers during accommodation (see below). C. Zimmermann.

Prigoshena, A. Staphyloma verum. *Sovetskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 876.

Staphyloma verum is frequently seen in myopes of over twenty diopters. It is not found in cases with atrophic choroidal changes nasally from the disc. It is produced by localized distention of the ocular wall, caused perhaps by rupture of the lamina vitrea and asymmetric development of the eyeball.

Ray K. Daily.

Strebel, J. The mechanism of accommodation and the action of the three systems of ciliary muscle fibers, as refuting discontinuity theories. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 235.

Strebel discusses the contradictions in Helmholtz' theory of accommodation and rejects the theories of discontinuity. He sees the solution of the problem in measuring the elasticity of the zonule and lens capsule.

C. Zimmermann.

Strebel, J. A simple model for demonstration of Pflugk's measurements of zonular elasticity and lens resistance and for refuting of Helmholtz' theory of accommodation. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 247.

The model is described and its purpose discussed. C. Zimmermann.

Tinker, M. A. Illumination intensities for reading. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1036-1039.

4. OCULAR MOVEMENTS

Garcia Miranda, A. The treatment of strabismic amblyopia and its results. *Arch. de Oft. Hisp. Amer.*, 1935, v. 35, Aug., pp. 393-403.

Of 32 cases treated in Schieck's clinic at Wurzburg, 21 were treated with occlusion bandage of the fixing eye followed by orthoptic training.

In children less than ten years old, vision improved considerably, to ten times the initial vision. In children of more than ten years, vision at the end of the treatment was only three or four times more than at first. Binocular vision was obtained in fifty percent. In eleven cases in which occlusion failed to improve vision, operation was required for cosmetic purposes, and was followed by occlusion and orthoptic training. In this group, the vision in children of less than ten years showed an improvement of 21 times over the initial vision. Binocular vision was obtained in three-fourths of the children of this group. (Bibliography.)

R. Castroviejo.

Hicks, A. M., and Hosford, G. N. The orthoptic treatment of squint. *Trans. Western Ophth. Soc.*, 1st annual meeting, 1934, p. 37. (See *Amer. Jour. Ophth.*, 1935, v. 18, Dec., p. 1162.)

Horay, Gustav. Experiences in 700 muscular advancements. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 289. (III.)

The technique of operation used within the last nine years is described in detail and the results tabulated. The shortening of the muscle counts more

than the advancement. It is found anatomically that the muscle mostly becomes attached to the tendon stump and not between this and the limbus.

C. Zimmermann.

5. CONJUNCTIVA

Anelli, Dantes. The nictitating membrane in the animal series. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 499-516.

The anatomic structure of the third lid of 29 animals was studied. Some contained glands of the acino-tubular type, having the same function as meibomian glands. It contained cartilage in some and muscular elements in other animals. In some birds there is a bimarginate arrangement and in other birds the exterior surface shows a keratinized epithelium similar to the skin. (Bibliography, one figure.)

M. Lombardo.

Balza, J., and Yalour, R. R. Local autohemotherapy in the treatment of trachoma. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 502.

Local autohemotherapy, or subconjunctival injection of 1 c.c. of the patient's own blood, has given the writers excellent results in pannus and corneal ulcer. The effect on the granulations has not been striking but there was general relief from photophobia. The blood is absorbed in from ten to twelve days, and the injection may be repeated every three or four days.

M. Davidson.

Bossalino, Giuseppe. Leucocytic formula in trachomatous patients before, during, and after autohemotherapy. *Boll. d'Ocul.*, 1935, v. 14, Feb., pp. 225-235.

Hematologic examination in 25 patients affected by trachoma showed hyperactivity of lymphatic organs, characterized by neutropenia compensated by lymphocytosis, monocytosis, and eosinophilia. The writer believes that the constitutional factor may be an indispensable condition for contracting trachoma, and at least facilitates its development, aggravates its symptomatology, and delays its recovery.

Hemotherapy, by helping the blood formula, improves the defense against trachoma. (Bibliography, 3 tables.)

M. Lombardo.

Brecher, L. Treatment of trachoma with trachocid. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 372.

Trachocid, a biologic derivative of animal virus (serpent and bee) is absolutely harmless and painless. With subconjunctival injections Brecher had good results in the treatment of trachoma. A case is reported in which trachocid cleared up an inveterate pannus.

C. Zimmermann.

Busacca, Archimede. A germ with the characteristics of *Rickettsia* (*Rickettsia trachomatis*) in trachomatous tissue. *Arch. d'Ophth.*, 1935, v. 52, Aug., p. 567.

The author points out that Cuénod, in a preliminary note on the presence of inframicrobic bodies in trachoma follicles (see *Amer. Jour. Ophth.*, 1935, v. 18, p. 985), did not mention Busacca's work on the same subject (see *Amer. Jour. Ophth.*, 1935, v. 18, p. 277). The author claims that he was the first to demonstrate these bodies but that his work has been ignored. (Illustrations.)

Derrick Vail.

Cuénod, A., and Nataf, R. Second note on the presence of inframicrobic elements in trachoma follicles. *Arch. d'Ophth.*, 1935, v. 52, Aug., p. 573.

These bodies, which are found in great abundance in all pure trachoma cases, cannot be shown by ordinary staining methods nor can they be cultured. They are only visible following fixation by the May-Grunwald method or by Azur II, followed by Giemsa staining. Here they are seen as points which are round or slightly oval, representing probably not the organism itself but its envelope. One finds these bodies in all intact epithelial cells, but especially in the abundant debris of these cells. To this debris, which is scattered in large quantities between the cells, the authors give the name *plastilles* (plasma droplets). In Giemsa preparations these droplets appear blue

violet, while the nuclei of the cells are rose violet. Busacca is given full credit for anticipating their work. By using cyanochine, a stain used for the identification of rickettsia, the authors have been better able to demonstrate and study the bodies. (Illustrations.)

Derrick Vail.

Gifford, S. R., and Lazar, N. K. Inclusion bodies in ophthalmia neonatorum. Further note. *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 197-202.

A two-percent infusion of senega was applied to the apparently normal conjunctiva of 26 infants. Inclusions identical with those of inclusion blennorrhea were found in scrapings from three cases. Twenty-seven more infants were treated in a similar manner, but no inclusions were found. It is thought that the virus of inclusion blennorrhea existed in a latent or nonvirulent form on the conjunctiva of those eyes in which inclusions were present, and that the use of a chemical irritant stimulated its growth so that it was easily found. (Photomicrographs.)

J. Hewitt Judd.

McKee, S. H. A study of the pneumococcus group from the inflamed conjunctiva and lacrimal sac. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1021-1029.

Ochi, S. A kind of microorganism in trachomatous tissue. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 193.

Ochi reports in detail seven cases which he inoculated successfully with trachomatous material. He found the same kind of microorganisms in the infected and infecting tissues.

C. Zimmermann.

Panico, Emanuele. Biomicroscopic aspect of normal and pathologic epithelial tissue of the conjunctiva. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 491-498.

With the slitlamp the epithelial tissue may be studied at the fornices, around a glandular orifice, at the lacrimal puncta, and in the caruncle. The writer describes keratinic degeneration,

vacuolar degeneration, the aspect of the structure in wounds of the conjunctiva and during cicatrization, in inflammatory conditions, in fatty degeneration, and in epithelial tumors of the conjunctiva. (Bibliography.)

M. Lombardo.

Puscariu, E., and Lazarescu, D. Considerations on eczematous keratoconjunctivitis in the ophthalmic clinic of Jassy. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 465-478.

Eczematous keratoconjunctivitis was studied in relation to tuberculosis; 684 patients being examined, 398 of them between five and twenty years of age. Lack of proper nutrition and hygienic life, especially important at these ages, was a predisposing factor. In 338 patients there was adenitis, tracheo-bronchial adenopathy, or pulmonary, cutaneous, or osteo-articular tuberculosis; while 270 out of 314 gave a positive tuberculin reaction, 203 of these being below twenty years. (Bibliography.)

M. Lombardo.

Soria, M. Tuberculosis of the conjunctiva. *Arch. de Oft. Hisp. Amer.*, 1935, v. 35, June, pp. 322-326.

The author reports a case of primary tuberculous infection of the tarsal conjunctiva. There was marked swelling of the preauricular gland. Culture of the pus removed from the gland revealed tubercle bacilli, and animal inoculation developed typical tuberculous lesions. A piece of affected conjunctiva showed the histologic structure of tuberculous lesions, but the Koch bacillus could not be demonstrated. (2 illustrations.)

R. Castroviejo.

Szily, A. Contribution to the etiology of so-called Parinaud's disease. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 315. (III.)

A woman aged 24 years showed clinically all the characteristics of true Parinaud's conjunctivitis due to bovine tuberculosis. The differential diagnosis between true Parinaud's and tuberculosis is discussed. To the clinical diagnosis of Parinaud's conjunctivitis

the respective etiologic terms, referring to *Bacterium pseudo-tuberculosis rodentium* or *tularensis*, or to bovine tubercle bacilli, should be added. The observation of Parinaud that the disease chiefly affected people who came in contact with animals seems to hold good for almost all the cases.

C. Zimmermann.

Van der Straeten and Appelmans. Ocular pemphigus. *Arch. d'Opht.*, 1935, v. 52, Aug., p. 545.

Ocular pemphigus may accompany any acute or chronic pemphigus of the skin or other mucous membranes, or may exist without any other localization of the disease. The characteristic bullae often escape notice because of their rapid rupture. The authors report in detail a case which they followed from the beginning for three years. It occurred in a young single woman presenting acute generalized pemphigus of the skin and mucous membranes of the mouth, nose, vulva, and especially conjunctiva. An exhaustive review of the literature is given, covering history, etiology, pathology, symptomatology, and diagnosis. The prognosis is always grave, and treatment, both general and local, is without much success.

Derrick Vail.

Vila Ortiz, J. M., Jr. The role of vagosympathetic imbalance in the etiology of spring catarrh. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, June, pp. 316-322.

This is a preliminary report. In 31 cases of spring catarrh the author has found different degrees of imbalance of the sympathetic system.

R. Castroviejo.

6. CORNEA AND SCLERA

Anelli, Dante. Extract of lacrimal gland in the repair of corneal ulcers. *Boll. d'Ocul.*, 1935, v. 14, March, pp. 352-359.

Instillation of an extract of horse lacrimal gland in the conjunctival sac of nine rabbits the cornea of which had been infected with a culture of staphylococcus and pneumococcus or

staphylococcus and streptococcus shortened the period of recovery from ulcers following the infection. The installation was used three times daily. The period of recovery was longer if the instillation was used only once daily, and in control rabbits in which none of the extract was used recovery began when the corneal ulcers in the other rabbits were in an advanced stage of repair. (Bibliography.) M. Lombardo.

Biozzi, G., and Lugli, L. Ring-shaped peripheral thickening in the region of Descemet's membrane. *Graefe's Arch.*, 1935, v. 134, p. 287.

In sixteen young individuals this familial and hereditary change was observed with the slitlamp. The condition consists of a delicate peripheral folding on the posterior surface of the cornea, not forming a complete circle although parallel to the limbus. It was never observed in the upper quadrant of the cornea. H. D. Lamb.

Bonnet, P. Palm-leaf corneal opacities, remnants of interstitial keratitis (annular type of Vossius). *Arch. d'Ophth.*, 1935, v. 52, Sept., p. 625.

The author presents the drawings of vascularization of the cornea in six patients. "Palm-leaf" keratitis is seen as a whitish disc, opalescent and sharply defined, situated in the deep layers of the cornea. The disc is divided by a sort of hilum arising from the limbus. The vessels form the ribs of the "fan" or "palm leaf." The opacity is considered as pathognomonic of hereditary syphilis. (Illustrations.)

Derrick Vail.

Castroviejo, Ramon. Keratoplasty. Clinical study of fourteen cases. The cornea of the fetus as material for transplantation. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, Aug., pp. 404-434.

The author describes different techniques of transillumination which may be used to examine eyes affected with corneal opacities. His operation, partial penetrating keratoplasty, is described in detail, and fourteen cases are reported. In nine cases the transplant

was obtained from eyes enucleated on account of conditions which left the cornea normal or almost normal (homotransplants). In one case the normal cornea of a blind eye was implanted in the leucomatous cornea of the second eye of the same patient (autotransplant). In four more cases the implant was obtained from the eyes of still-born infants, enucleated shortly after delivery and kept from five to 72 hours in serum of the patient or Ringer solution, at a temperature of 2°C. above zero. Improvement of vision after operation was obtained in ten cases. The least improvement was from light perception and projection to counting fingers at two feet; the greatest from hand motion at one foot to 20/30.

R. Castroviejo.

Esteban, M. Some details in the Denig operation. *Rev. Cubana Oto-Neuro-Oft.*, 1935, v. 4, May-Aug., p. 90.

In the Denig operation, which the author uses frequently and with good results in trachomatous pannus, the following technique is found of advantage. No conjunctiva is excised, retraction by the blepharostat being sufficient to pull the conjunctiva away. Sutures are passed into the buccal transplant before its separation, to facilitate handling. (Illustrated.)

M. Davidson.

Fiore, Tito. Researches on the chemistry of argyrosis. *Boll. d'Ocul.*, 1935, v. 14, March, pp. 360-370. (See Section 16, Injuries.)

Friede, Reinhard. Corneal homoplastin or autoplasty. *Zeit f. Augenh.*, 1935, v. 87, Aug., p. 15.

Further experience convinces Friede of the superiority of autoplasty over homoplasty. In one case the former succeeded after a failure with the latter. The automatic trephine, a necessary instrument, is in need of refinement. It is essential to thoroughly anchor the graft, and the author uses a double cross of silk suture through the conjunctiva. Once he was forced to put sutures into the graft and cornea and the operation was successful. He does

not use a tobacco-pouch suture because complete dissection of the conjunctiva causes, in his opinion, too great disturbance of corneal nutrition.

F. Herbert Haessler.

Galeazzi, Cesare. Imperfect osteogenesis and blue sclera. *Boll. d'Ocul.*, 1934, v. 13, Dec., pp. 1602-1618.

The author reports five cases with lesions of the bony system due to abnormal osteogenesis, with typical blue discoloration of the scleras. All were in females, the oldest being 22 years of age. Four patients were members of two related families. One of the patients had hypocusia. With the exception of the blue scleras the ocular apparatus was normal in each case. (Bibliography, 9 figures, 2 in color.)

M. Lombardo.

Kazas, I. I. Etiology of Hutchinson's keratitis. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 848.

Commenting on Dvorczetz' article on ocular complications of gripe, in which Dvorczetz mentions parenchymatous keratitis as one of the complications, Kazas holds that this statement was made on insufficient evidence.

Ray K. Daily.

Lijo Pavia, J., and Dusseldorp, M. Marginal keratitis with ectasia. *Rev. Oto-Neuro-Ofth.*, 1935, v. 10, Aug., p. 210.

In this rare case of unilateral involvement, without vascularization, neither a diagnosis of luetic parenchymatous keratitis, nor of marginal dystrophy with ectasia of the cornea, nor of bulbous keratitis fitted the picture. Ovarian hypofunction was present. Recovery was spontaneous. (Illustrated.)

M. Davidson.

Lugli, L. "Oil-globule" degeneration of the cornea. *Graefe's Arch.*, 1935, v. 134, p. 211.

The clinical, biomicroscopic, and pathologic findings in nine cases are reported in detail. The condition is characterized by opacity of the corneal epithelium and by many small round subepithelial foci, the latter more numerous and coarser in the periphery of

the cornea. The foci are canary-yellow by direct light, amber by transmitted light. The opacity in the corneal epithelium is confined to the periphery. Formations like drops of oil are found in Bowman's membrane and in the more superficial lamellae of the substantia propria. The course of the degeneration is slowly progressive without a sign of irritation or of a cyclitic inflammation. All the individuals affected were over sixty years of age. Five had had senile cataract, one had glaucoma, and two showed the remains of old iridocyclitis. The disorder affects both eyes and begins at the nasal and temporal margins of the cornea.

H. D. Lamb.

Puglisi-Duranti, G. Spindle pigmentation of the posterior surface of the cornea. (Krukenberg spindle.) *Arch. di Ottal.*, 1935, v. 42, May-June, p. 183.

Three cases of Krukenberg's spindle are described, in two of which the refractive error was hypermetropic. Biomicroscopically the pigment was found to be intracellular and the author is of the opinion that there is an endothelial dystrophic alteration in such cases.

Herman D. Scarney.

Ralli, E. P., Gresser, E. B., and Flaum, G. Effect of experimental diabetes on the cornea of dogs. Its relationship to the administration of vitamin A. *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 253-262.

The eyes of four normal dogs and two with the pancreatic ducts ligated showed no pathologic changes regardless of the amount of vitamin A in the diet. Five depancreatized dogs showed corneal changes, primarily those of keratinization of the epithelium and swelling of the endothelium. These had received no vitamin A with one exception, in which cod-liver oil was given after the dog had been diabetic for 33 days. The two diabetic dogs not showing corneal changes were evidently protected against this condition by an ample supply of vitamin A. In both normal and depancreatized dogs the amount of vitamin found in the liver

corresponded to the amount fed, but the symptoms in the depancreatized animals suggested a relative deficiency of vitamin A. (Photomicrographs.)

J. Hewitt Judd.

Siegert, Peter. The symptomatology of keratitis pustuliformis profunda. Zeit. f. Augenh., 1935, v. 87, Sept., p. 89.

The author describes four atypical cases. The first was in a woman. Hypersensitivity developed to the first large dose of salvarsan. In the second case hypopyon and iritis increased after the first two small doses of salvarsan. This was interpreted as a Herxheimer reaction and was avoided in later experience by using a very large initial dose. The last two cases were not clearly characteristic. The clinical course or history strongly suggested congenital syphilis. Diagnosis was based on the abscesslike opacity and immediate response to salvarsan. In a fifth patient the diagnosis was doubtful.

F. Herbert Haessler.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Boshes, Benjamin, and Mayer, L. L. The lid-closure reflex of the pupil. Amer. Jour. Ophth., 1935, v. 18, Nov., pp. 1048-1051.

Davies, W. S. Uveitis with associated alopecia, poliosis, vitiligo, and deafness. Arch. of Ophth., 1935, v. 14, Aug., pp. 239-243.

The clinical findings in the 21 cases previously reported are summarized and the various theories of etiology are reviewed. The disease is strikingly similar to sympathetic ophthalmia both in ocular findings and in associated complications. Treatment is the same as in the usual case of uveitis. In the case reported, a man aged 31 years presented bilateral uveitis with vision reduced to light perception. He had alopecia, poliosis, and deafness, but no evidence of vitiligo. (Photograph.)

J. Hewitt Judd.

Ludwig, Alfred. Angioma of the choroid with nevus of the temporal

region. Klin. M. f. Augenh., 1935, v. 95, Aug., p. 168.

In a woman of 28 years a diagnosis of angioma of the choroid was based on angioma of the skin of the temple, age, coarse configuration of the choroidal vessels, defective pigmentation of the area of the tumor, pigment streaks reminding one of those observed after reattachment of the retina, flat retinal detachment, a corresponding defect of the visual field, opacities of the vitreous, lack of marked diascleral shadow, and distinct diaphanosopic contrast.

C. Zimmermann.

Meyer-Waldeck, F. Technique of autohemotherapeutic blood injections into the anterior chamber. Klin. M. f. Augenh., 1935, v. 95, Aug., p. 250.

The author refutes the criticism of his method by Vannas (Amer. Jour. Ophth., 1934, v. 17, p. 1078) and defends the procedure as simple, without danger, and, if correctly executed, successful.

C. Zimmermann.

Smaltino, Michele. Ocular complications in spondylosis rhizomelica. Boll. d'Ocul., 1934, v. 13, Dec., pp. 1619-1634.

The author gives the history of two patients, aged respectively 35 and 37 years, and affected by spondylosis rhizomelica, both of whom had recurrent attacks of iritis of the left eye, one marked hypopyon. The fact that the iritis recurred at the time of attacks of the general disease shows that both lesions arose from the same cause. (Bibliography, 3 figures.)

M. Lombardo.

8. GLAUCOMA AND OCULAR TENSION

Berens, Conrad. A curved keratome for sclerectomy operations. Amer. Jour. Ophth., 1935, v. 18, Nov., p. 1053.

Del Barrio, A. Internal fistulization produced by sclero-ciliary iridencleisis in glaucoma. Arch. Oft. Hisp. Amer., 1935, v. 35, July, pp. 355-374.

The author's technique resembles the Mauksch cyclodialysis with incarceration of the iris between the sclera

and the detached ciliary body. In the author's technique the scleral incision is made with a keratome, the cyclodiolysis effected with a spatula, the iris brought out to the scleral incision with a blunt hook, and a small sphincterectomy is performed, leaving the iris incarcerated between sclera and ciliary body without tendency to return to its normal position. The 39 cases so operated upon were followed for from fifteen days to fifteen months. Good results were obtained in 85 percent of cases of chronic glaucoma, 100 percent of chronic simple glaucoma, 40 percent of secondary glaucoma, and 50 percent of the absolute type. (5 illustrations, bibliography.) R. Castroviejo.

Villani, Giuseppe. Action of diathermy on ocular tension. *Boll., d'Ocul.*, 1935, v. 14, Feb., pp. 181-201.

The ocular tension was found lowered after a current of from 300 to 600 ma. applied for twenty minutes to seventy eyes which were either normal or affected by acute localized or diffuse diseases of the cornea, diseases of the anterior uveal tract, or some form of glaucoma. The tension was found lowered soon after the treatment, remained so for several hours, and even reached a lower degree at each application. In two cases of complicated glaucoma the tension remained unchanged. (Bibliography, 5 figures.) M. Lombardo.

9. CRYSTALLINE LENS

Appleman, L. F. Intracapsular cataract extraction by the Knapp method as compared with the classic procedure. A further report. *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 249-252.

This report is based on 300 extractions done in the author's clinic in Wills Hospital. The visual results of 126 intracapsular extractions are summarized and compared with those of 164 extractions with capsulotomy. Vision of 6/12 or better was obtained in about 10 percent more by the intracapsular method. The average hospital stay was three days shorter because recovery was smoother and practically

free from reaction. General adoption of this method is urged.

J. Hewitt Judd.

Bakker, C. The lens in arachnodactyly. *Arch. f. Augenh.*, 1935, v. 109, Oct., p. 353.

The author studied four congenitally dislocated lenses associated with arachnodactyly. The lenses were thick, but smaller in horizontal and vertical diameters than normal lenses. Their weight was considerably diminished. The lenses appear to have been arrested in development at the seventh month of embryonic life. Since all accompanying changes are of mesodermal origin, the lens changes can be explained as due to insufficient development of the posterior vascular tunic of the lens. The posterior part of the lens fibers, being insufficiently nourished, fails to develop, while the anterior part of the same fibers develops undisturbed. The anterior part of the lens is therefore broader than the posterior, and the fibers bend as they pass backward.

R. Grunfeld.

Bietti, Giambattista. Vitamin C (ascorbic acid) in ocular fluids and tissues: its relations to biology of the lens. *Boll. d'Ocul.*, 1935, v. 14, Jan., pp. 3-33.

The vitamin-C content in ocular fluids and tissues of different animals was studied by reduction of dichlorophenolindophenol. The author also investigated the antiscorbutic properties of aqueous and lens and the possibility of increasing the reducing power by intake of vitamin C; the reducing power of aqueous in ocular inflammatory processes and in lesions of ciliary epithelium; and the possibility of etiologic relations between cataract and vitamin-C deficiency and of influencing the course of experimental cataract by supplying ascorbic acid. The writer is not inclined to admit that cataract may result solely from vitamin-C deficiency. (Bibliography.) M. Lombardo.

Di Fede, N. The medical treatment of cataract. *Rev. Cubano Oto-Neuro-Oft.*, 1935, v. 4, May-Aug., p. 76.

The author reports nineteen cases treated by iontophoresis, with improvement in visual acuity. With Angelucci and others he believes that iontophoresis marks an advance in the medical treatment of cataract and is not an illusory treatment. M. Davidson.

Euler, H., and Malmberg, M. New experiments concerning ascorbic acid (vitamin C) in animal lenses. *Arch. f. Augenh.*, 1935, v. 109, July, p. 225.

The amount of vitamin C present in the lens is determined by the Tillman titration method, subtracting the amount of glutathione. In the cattle eye it amounts to 0.4 mg. (younger animals having a higher value); in rabbits and guinea pigs to 0.16 mg.; in human lens to 0.31 mg.; in the cataractous human lens from zero to 0.05 mg. per gram of lens. Ascorbic acid has the high oxidoreduction potential of -0.20 . It is reversibly oxidized and can be reduced with hydrogen sulphide. It increases the effect of katepsin. In the lens there exists a group of dehydrogenizing agents including glutathione, cozymase, and flavin. The amount of cozymase is 50 co (a cozymase unit which produces 1 c.c. of carbon dioxide per hour by ferment activation) per gram of lens. The flavin is present either free or bound to phosphoric acid, or to a protein as flavin enzyme. Ascorbic acid originates partially from the blood, partially in the lens itself. Hypothetically it may be derived from a hexose or a hexophosphate.

R. Grunfeld.

Goldmann, H., and Buschke, W. Blood-aqueous barrier and vitamin C. 2nd communication. *Arch. f. Augenh.*, 1935, v. 109, Oct., p. 314.

The ascorbic-acid content of the aqueous is ten times the amount of vitamin C in the blood. The present experiments serve to prove that the lens does not synthesize ascorbic acid from sugar, but stores the vitamin C of the blood, which the lens reduces to ascorbic acid. Intravenous injection of ascorbic acid into rabbits led to a large increase of ascorbic acid in the aqueous, but only after the ascorbic

acid had become gradually oxidized in blood to vitamin C. The same result took place when rabbits were fed with ascorbic acid. When vitamin C in blood decreased, the aqueous lost its ascorbic acid proportionally. These experiments prove a constant relation between vitamin C in the blood and ascorbic acid in the aqueous, and this relation may prove useful as a functional test for lens metabolism. R. Grunfeld.

Grzedzielski, Jerzy. Histology of roentgen cataract. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 360. (See Section 16, Injuries.)

Gut, Adolf. Posterior senile subcapsular cataract; its diagnosis and its surgical prognosis. *Zeit. f. Augenh.*, 1935, v. 87, Sept., p. 77.

From Vogt's clinic 33 cases of posterior subcapsular cataract are described. All had not only posterior subcapsular opacities but also anterior vacuoles, and very delicate opacities directly under the capsule, which could be seen only upon critical focusing. The opacities are not the beginning of senile cataract but the end stage of a senile total sclerosis of the lens. The same changes may also be preceded by corneal cataract, cuneiform cataract, spicule formation, and lamellar splitting. With a large incision these cataracts are easily and successfully removed as the anterior cortex comes out cleanly. The cataract of myotonic dystrophy may be distinguished by the rosettelike character of its posterior opacity and the colors and glistening points in it. The subcapsular cataract here described not infrequently reduces vision so rapidly as to force operation in less than one year.

F. Herbert Haessler.

Müller, H. K. Biochemical eye-changes produced by naphthalin and the influence of vitamin C upon them. *Arch. f. Augenh.*, 1935, v. 109, Oct., p. 304.

The ability of the lens to prevent the ascorbic acid of the aqueous from becoming oxidized in vitro was temporarily lost by lenses of rabbits that had been fed with naphthalin. The loss was

in direct relation to the amount of naphthalin fed; such lenses even assisting in the oxidative process. Intravenous injection even of a great amount of ascorbic acid counteracts only slightly the effect of the naphthalin. It is assumed that the deleterious effect of naphthalin depends not on the fact that it oxidizes the ascorbic acid, but that it disturbs the relation of the redox systems to each other. R. Grunfeld.

Mura, F. Contribution to the etiology of senile cataract. *Boll. d'Ocul.*, 1935, v. 14, April, pp. 526-548.

From clinical and laboratory researches on 22 patients affected by cataract, the writer concludes that the disease was not in relation to age, which ranged within wide limits; to blood pressure, which varied from 85/45 to 210/90 mm. Hg; to intraocular pressure, which was within normal limits; to the glycemie, the uremic, or calcium-potassium percentage, which did not go above normal limits; or to renal function. The writer is inclined to associate the pathogenesis of senile cataract with dysfunction of the endocrine system, particularly of the thyroid, hypophysis, and suprarenal, in relation to the process of senile involution. (Bibliography.) M. Lombardo.

Pallares Lluesma, J. Hernia of the iris. Complications of cataract operation in eyes with pterygium. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, June, pp. 326-329.

Cataract extraction was performed on a patient with recurrent pterygium on the nasal side. Three days later a small hernia of the iris was found nasally. The author believes the hernia was produced by imperfect closure of the incision, due to traction by the pteryg-
R. Castroviejo.

Palmieri, Leopoldo. Experimental researches on the pathogenic mechanism of congenital lens opacities. *Boll. d'Ocul.*, 1934, v. 13, Dec., pp. 1635-1647.

Examinations made in 53 rabbits born of 23 mothers which while pregnant had been immunized passively

with rabbit anti-lens serum obtained from the chicken, and actively with lenticular proteins, indicate that immunologic procedures do not provoke lens changes in the new-born.

M. Lombardo.

Rubino, A. Cataract and spasmodophilia. *Boll. d'Ocul.*, 1935, v. 14, Jan., pp. 153-171.

Experiments were made to ascertain whether cataract could be produced in rabbits by intoxicating them with a tetanogenic poison such as one of the guanidin group. Neither biomicroscopic examination between the tetanic attacks nor histologic examination of the enucleated eyes revealed any lesions in the crystalline lenses. The author excludes a purely toxic origin of cataract in tetany. In such cases the cataract may result from changes of the ionicsaline electrolytic system of the kind found in tetany from thyroid deficiency. (Bibliography.) M. Lombardo.

Schroeder, Hans. New speculum and lens forceps for the intracapsular cataract operation. *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 268.

Solid blades are fitted on a rigid U-shaped piece which is of two sizes, permitting a 25 or a 32 mm. opening. Its construction is well shown in the photographs. The lens forceps is a modification of Terson's, of which each blade is fitted with two long teeth intended to grasp the lens substance instead of the capsule.

J. Hewitt Judd.

Selinger, Elias. Effect of extract from cataractous human lenses on senile cataract. *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 244-248.

The previous conflicting reports on the use of lens antigen are reviewed and the author's method of preparation of the extract from senile cataractous lenses is described. Five patients with bilateral incipient progressive senile cataract were selected and given subcutaneous injections twice a week for three months. Two showed initial improvement in vision followed by rapid reduction. Two remained unchanged af-

ter four months and eighteen months respectively, while in the fifth the vision remained improved after fifteen months; although the slitlamp revealed that the cataracts were still progressing. The extract seemed to have no effect on the progress of senile cataract.

J. Hewitt Judd.

Strachov, V. P. Impressions on intracapsular cataract extraction and some details of its technique. *Sovietskii Viestnik Ophth.*, 1935, v. 6, pt. 6, p. 768.

The author recounts the development of intracapsular extraction at the end of last century in Russia. In spite of loss of vitreous and iridocyclitis in thirty percent of the cases the Russian ophthalmologists stood by their procedures. The development of such safeguards as effective anesthesia, analgesia, akinesis, retrobulbar injection, and dependable fixation led to entirely different results. The author discusses in detail the significance of the thickness, tenseness, and elasticity of the lens capsule. He does intracapsular extraction with an iridectomy, and does not tumble the lens. In discussing postoperative complications he reports three cases of postoperative hemorrhage into the anterior chamber and vitreous several days after the extraction. The author believes that the hypotony associated with intracapsular extraction is conducive to hemorrhage from the iris and ciliary body.

Ray K. Daily.

Strampelli, Benedetto. Biomicroscopy and histology of cataract by polarized light. *Boll. d'Ocul.*, 1934, v. 14, Jan., pp. 34-125.

An extensive report is given of the biomicroscopic findings in nuclear cataract, under polarized light, together with some histologic findings. (47 tables, 225 figures in black or color, bibliography.)

M. Lombardo.

10. RETINA AND VITREOUS

Basile, Giambattista. Effects of roentgen therapy in thrombosis of the central retinal vein. *Boll. d'Ocul.*, 1935, v. 14, Feb., pp. 236-253.

The writer gives the history and results of treatment with small doses of filtered X rays in twelve patients affected by thrombosis of the central vein or some of its branches. The hemorrhages were absorbed in a relatively short time, with disappearance of stasis. The vision improved in every case, and the treatment did not cause any change in the lens or in other ocular structures. (Bibliography.)

M. Lombardo.

Baurmann, M. Destructive processes in the vitreous of the human eye and their importance for the formation of retinal tears. *Graefe's Arch.*, 1935, v. 134, p. 201.

Four normal eyes from patients aged respectively 16, 31, 34, and 55 years showed definite disintegration in the fine structure of the vitreous, resulting in the formation of holes in the vitreous. A firm anatomic union exists between the vitreous and the retina, the epithelial layer of the ciliary body. This anatomic relation, in association with the very considerable tearing of the vitreous to disintegrate, leads to considerable traction at several points in the most anterior part of the retina when the eyeball is moved, and forms a basis for occurrence of some retinal tears.

H. D. Lamb.

Bunge, E. Observations on uniform treatment of retinitis pigmentosa and determination of sexual hormones in the urine. *Zeit. f. Augenh.*, 1935, v. 87, Aug., p. 26.

In 264 family trees of recessively inherited retinitis pigmentosa collected in the literature Wibaut found that 57.5 percent of the afflicted persons were males. He hypothetically ascribed the relative minority of the females to the action of female hormones and therefore tested the therapeutic use of follicle hormone in the preparation menformon. To each of five patients he gave 500 to 1,000 units of menformon per day by mouth. He got no evidence that menformon was responsible for the slight improvement observed in two of them. The treatment did no harm. He discusses the possible modes

of action of the hormone: vasodilatation and direct action on the nervous tissue. Quantitative estimation of sexual hormones in retinitis pigmentosa showed androchinin to be excreted in normal amounts and thelykin in greatly reduced amounts.

F. Herbert Haessler.

Deutschmann, R. Again the retinal tears. *Zeit f. Augenh.*, 1935, v. 87, Oct., p. 203.

Deutschmann records some new observations to reiterate his belief (1) that retinal tears are secondary to detachment and are a compensatory mechanism to relieve tension in stretched retinal tissues; and (2) that retinal detachment can heal without sealing of the hole and often does not despite such closure. By his method of repeated puncture 25 to 30 mm. out of the eyes healed as satisfactorily as the 30 percent that are claimed by other methods now in vogue. Herbert Haessler.

G. von. Epipapillary membrane and persistent hyaloid artery. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 537.

In a boy of seventeen years with hyperphoria, narrow palpebral fissure, and slight enophthalmos, a membrane covered the vessels and the lower half of the disc, and from it a persistent hyaloid artery floated freely into the vitreous. The theory of insufficient involution of the ectodermal sheath and hyaloid artery, to account for the epipapillary membrane, is therefore valid.

M. Davidson.

Hesky, Mario. A case of spontaneous perforation of retina without detachment, in myopia, with a retinal flap protruding in the vitreous. *Boll. d'Ocul.*, 1935, v. 14, Jan., pp. 126-152.

A man of 38 years showed, even nine years after the first examination, a hole in the retina in the 10.30 o'clock meridian, in an eye myopic 16 D. A retinal flap protruding into the vitreous, and originating from a horseshoe laceration, was adherent by its base to the margin of the hole. The writer is of

opinion that this adhesion prevented a flow of vitreous outside the retina and consequent detachment of the retina. (Bibliography.) M. Lombardo.

Jancke, Gerhard. Cysts and detachment of the retina in a young man. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 145. (Ill.)

The right retina of a man aged 21 years presented two large cysts and a large tear at the ora serrata, probably produced by traction from the cysts. The eye had secondary glaucoma. As the left retina also showed symmetrically situated cysts, the affection was perhaps due to congenital inferiority of the retinal tissue.

C. Zimmermann.

Karasek, Otto. Angiomatosis retinae. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 160. (Ill.)

The right eye of a man of 27 years, in the second stage of angiomatosis retinae, showed in the upper part of the fundus a triangular tumor protruding 5 D., in which terminated a vein enlarged to four times its normal size. There were capillary venous glomeruli and numerous yellowish-white retinal spots. The retina surrounding the mass was flatly detached. Vision was 6/60. There was an absolute central scotoma for colors, and a pear-shaped scotoma in the inferior temporal quadrant. On account of a slight tendency to fall, and tremor of the protruded tongue and fingers, the possibility of a cerebellar tumor could not be excluded. Heredity was doubtful.

C. Zimmermann.

Lambert, R. K. Studies of the retinal circulation by direct microscopy. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1003-1012.

Lijo Pavia, J. Scleral transillumination in retinal detachment, for precise localization of tear. *Rev. Oto-Neuro-Oft.*, 1935, v. 10, Aug., p. 201.

The author quotes his own description of the technique in a previous paper under a different title (see *Amer. Jour. Ophth.*, 1934, v. 17, p. 1085).

Lijo Pavia, J. A periscope as an aid to diascleral transillumination for retinal localization. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 371. (Ill.)

During operation for a retinal tear 2 mm. lateral from the optic nerve in the horizontal meridian, coincidence of the center of the tear with the illuminated point of Lange's lamp, applied to the sclera, could be directly observed through the cornea.

C. Zimmermann.

Marchesani, O., and Stauder, K. H. Cerebral symptoms with retinal periphlebitis (angipathia retinae juvenilis). *Arch. f. Augenh.*, 1935, v. 109, Oct., p. 281.

The authors describe eight such cases. Beside retinal periphlebitis they found symptoms of thromboangiitis obliterans in the extremities, with neurologic symptoms such as abducens, facial, or trigeminal paresis, and paresis of the extremities. The first symptoms are of a purely focal nature. Later, when the vasomotor disturbance spreads, they take on the characteristics of a diffuse brain disease resembling multiple sclerosis. Though the afflictions are not of hemiparetic type they are overwhelmingly one-sided, differing in this respect from multiple sclerosis. The disease affects only youth between the ages of 30 and 35 years.

R. Grunfeld.

Moreu, A. The temperature dosage in treatment of retinal detachment by electrocoagulation. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, Sept., pp. 460-472.

The pyrometric electrode of Coppez is briefly described by the author, who finds it inaccurate and too delicate. A control on the principle of the electric regulator of Regaud will be used by the author, who will report his results.

R. Castroviejo.

Pereira, R. F. Remarks on the surgical treatment of retinal detachment. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 543.

A case in which application of the electrode was unduly prolonged because of its defectiveness and in which

intraocular hemorrhage resulted on the eighth day, was reexamined six months later. A small area of proliferating retinitis was found at the site of each puncture, and the retina was perfectly reattached, but vision nil. On the basis of two other cases of retinal detachment in which a seeming hole in the macula proved by red-free ophthalmoscopy to be really macular detachment, the writer warns against hasty diagnosis of hole in the macula. Diathermal puncture is the best and an almost harmless treatment.

M. Davidson.

Pereira, R. F. Retinal detachment and diathermy. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 473.

Pereira suggests that retinal detachment cases operated upon with reattachment but without functional restoration should not be reported as cured and that a case which relapses should not figure as a cure except when successfully reoperated upon, and only as one successful case.

M. David

Puglisi-Duranti, Giovanni. Lesion from diathermo-coagulation in vitreous. *Boll. d'Ocul.*, 1935, v. 11, March, pp. 383-445.

Thirty-four rabbit eyes were used, employing a current of from 250 to 50 ma., and a coagulation time from seven to twelve minutes. The vitreous was reached with an insulated needle through sclera, choroid, and retina. Biomicroscopic examination was made every two or four days, and the eyes were enucleated at different intervals of time for microscopic examination. In every case the retina was found detached, and tears were visible in seven cases. Hemorrhages in retina and vitreous, striations due to coagulation of the vitreous, adhesive chorioretinitis, exudations in the anterior chamber, hyperemia of the uveal tract, and in some cases cataract were also encountered. (Bibliography, 36 figures.)

M. Lombardo.

Raverdino, Emilio. The treatment of retinal detachment of tuberculous ori-

gin without tear. *Boll. d'Ocul.*, 1935, v. 14, March, pp. 371-382.

A woman of 39 years with detachment of the lower part of the retina showed a positive Pirquet reaction and marked dullness at the apex of the upper lobe of the right lung. No tear was visible. The writer trephined the sclera and obtained permanent reattachment, verified four years later. The writer believes that trephining is the logical method of treatment in detachment of tuberculous origin, as tuberculous exudates have a tendency to form adhesions between the detached coats while appropriate general treatment takes care of the tuberculous lesion of the choroid. (Bibliography 5 figures.)

M. Lombardo.

intelen, F. The histopathology of fundus changes in Niemann-Pick's disease. (. . . relation between Tay-Sachs idiocy and Niemann-Pick lipoidosis. *Arch. f. Augenh.*, 1935, v. 109, p. 332.

or to a prominent greenish-gray circle around the red fovea centralis in Tay-Sachs amaurotic idiocy and in the great majority of cases of Niemann-Pick phosphatid lipoidosis is due to edematous imbibition and breaking up of the inner granular and reticular layers of the retina; and also to lipid infiltration of the ganglion cells and to increase in glial tissue. The degenerated cells liberate toxic substances producing the edema. The cell decay is a long protracted process, hence the persistence of the edema. In the macular region the degenerate cells are most numerous, so that the edema is limited to this area. The author studied one case of Niemann-Pick disease with characteristic macular findings. The lipid infiltration of the ganglion cells was not so outspoken as it would have been in a similar case of Tay-Sachs idiocy. Atrophy of the optic nerve and of the nerve fibers of the retina was absent.

R. Grunfeld.

Sabbadini, Dario. Contribution to the surgery of retinal holes at the posterior

pole of the eye. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 349. (Ill.)

In a woman of 27 years a submacular hole was cured by diasclear electrocoagulation, without central scotoma. The measuring apparatus, a modification of Lindner's, is described. After a review of the literature, the author affirms the possibility of operating on posterior retinal holes, but this must be done below the hole to secure real agglutination. Canthotomy and resection of the external rectus seem unavoidable.

C. Zimmermann.

Tertsch, Rudolf. Pendulous tissue strand in the vitreous as congenital anomaly or early (intrauterine?) inflammation. *Zeit. f. Augenh.*, 1935 v. 87, Oct., p. 199.

The anomaly was observed in a fourteen-year-old boy with very low visual acuity in one eye. A massive strand of white tissue projected into the vitreous and had free pendulous motion. It took origin over the superior temporal retinal vein in an area of striate opacity of the retina which traversed the fundus from the disc through the fovea to the utmost visible limit.

F. Herbert Haessler.

Weekers, L. Laboratory experiments concerning the surgical treatment of retinal detachment. *Arch. d'Opht.*, 1935, v. 52, Sept., p. 636.

From experimental evidence the author finds that the episcleral tissue plays a predominant part in the cicatricial process between the retina and the globe. Sclera and choroid on the other hand play no part, or at most a small one. At times the episcleral proliferation is slight, again exuberant, but never absent. External galvanocauterization of the sclera, without perforation, leads to adhesive scars of the choroid, and the same occurs when a caustic substance (tincture of iodine) is injected subconjunctivally. Every extended and diffuse choroidal reaction is bad. Not only must the sclera be perforated, but also the choroid, in order to obtain a satisfactory result. The best choroidal scars are those which result

from mild localized lesions. From these thoughts the author evolved a new technique, consisting of finely pointed galvanocauterization of the sclera as far as the choroid, with multiple punctures. After this is completed the choroid is perforated at each place with the very sharp point of an especially ground Graefe knife. (Illustrations.)

Derrick Vail.

Weskamp, R. L. Treatment of retinal detachment by diathermocoagulation. Arch. de Oft. de Buenos Aires, 1935, v. 10, July, p. 504.

The author reports on six cases operated on by the Weve method with four cures, one partial reattachment, and one failure complicated by diabetes and hypertension. (Illustrated.)

M. Davidson.

Wüllenweber, G. What significance have retinal hemorrhages for diagnosis, prognosis, and therapy of general disease. Zeit. f. Augenh., 1935, v. 87, Oct., p. 175.

The author, an internist, discusses the diagnostic importance of retinal lesions associated with hemorrhage. In infectious diseases retinal hemorrhage occurs and is probably analogous to brain hemorrhage in grippe and in encephalitis. Diagnosis may be difficult; the prognosis is good. Retinal hemorrhage in sepsis may be the one manifestation that the disease is no longer localized but has begun to metastasize. In endocarditis it makes the prognosis much worse. In avitaminosis, thrombocytopenia, and vascular damage, skin hemorrhage occurs in dependent parts; so that the author suggests sleeping with the head high to avoid retinal hemorrhage. Nephritic retinitis is a result of hypertension and not of uremia. The retinitis of pregnancy is a manifestation of arterial spasm. In essential hypertension, retinal hemorrhage is to be evaluated like cerebral hemorrhage.

F. Herbert Haessler.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Colomba, Niccolo. Behavior of chromatic sense in various affections of the

optic nerve. Boll. d'Ocul., 1935, v. 14, April, pp. 553-594.

The writer tested the chromatic sense in nineteen patients two of whom had tabetic atrophy, six descending atrophy, four postneuritic atrophy, two retrobulbar neuritis, and five papilledema. Central sensibility was first tested, and then peripheral every ten degrees along the two principal meridians. The results for red, green, and blue are given in tabular form. Chromatic sensibility was reduced in all cases. In tabetic and descending atrophy sensibility to green was more reduced. In some cases chromatic sense was not diminished in proportion to central visual acuity. The limits of the field for form and colors were the same in all cases. (Bibliography.)

M. Lombardo.

Fischer, Franz. Clinical study of optic atrophy in tumors of the hypophysis. Zeit. f. Augenh., 1935, v. 87, Oct., p. 175.

To assist differentiation of the various forms of optic atrophy, Fischer has studied the records of all the cases that have served in his clinic in the last ten years including 59 of endosellar hypophyseal tumor, almost all operated on by Hirsch according to his own endonasal technique. Early in the disease, the discs may be normal though bitemporal hemianopsia and defective vision may already be present. The commonest papillary finding is temporal pallor. Successful operation does not always stop the progress of the papillary changes, even though vision and field remain stationary or improve. In contrast, the disc of tabetic atrophy is almost never normal when the visual functions have become abnormal. Though the pallor in tabetic atrophy may be temporal in its beginning, it soon becomes total; and from beginning to end the atrophic disc of tabes is strikingly white. In retrobulbar neuritis, a normal papilla early in the disease is common, the temporal pallor that develops remains limited to the temporal half or a sharply circumscribed part of it, and when the nasal half of the disc becomes involved this

is only after long continuance of the disease or repeated recurrence.

F. Herbert Haessler.

Jensen, C. D. F. Hyaline bodies (drusen). *Arch. of Ophth.*, 1935, v. 14, Aug., pp. 269-281.

The author reviews the literature and reports a case in which drusen of the nerve head were found in one eye of a girl aged nine years. (Photographs, bibliography.) J. Hewitt Judd.

Joiris, N. P. Positive and transitory central scotoma (Weekers' sign) in retrobulbar optic neuritis, in the course of acute intoxication by methyl alcohol. *Ch. d'Ophth.*, 1935, v. 52, Aug., p. 578.

Weekers has described a positive transitory central scotoma in retrobulbar optic neuritis due to chronic methyl alcohol poisoning (see *Amer. J. Ophth.*, 1934, v. 17, p. 1192). This sign is not absolutely pathognomonic of methyl alcohol poisoning, but is rarely which it is. The author reports, or to a man aged 41 years, who clinically intoxicated drank a glass of methyl alcohol. Twelve days later ocular examination revealed an enormous bilateral scotoma in each eye. When these had cleared, positive transitory central scotomata were demonstrated. The author claims that Weeker's sign can be used to differentiate toxic amblyopia from other forms of acute retrobulbar optic neuritis. (Illustrations, references.) Derrick Vail.

Koyanagi, Y. The genesis of choked disc in nephritic retinitis. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 182, (III.)

Four fatal cases of nephritis with choked disc are described clinically and anatomically. In none was the lamina cribrosa displaced forward. Rather it was displaced backward, even in case two, in which lumbar puncture had revealed increased intracranial pressure. Therefore the author interprets choked disc in nephritic retinitis as a merely intraocular process, an edema from a toxic secretion of the pigment epithelium. There were no inflammatory changes. C. Zimmermann.

Lauber, H. The relation of general and retinal blood pressure to intraocular tension, and its influence on the optic nerve and retina. *Zeit. f. Augenh.*, 1935, v. 87, Sept., p. 65.

Method and apparatus for measurement of blood pressure in the retinal vessels—of which Sobanski's modifications made in Lauber's clinic are accounted best—have yielded new facts. The pressure in the retinal arteries has in great degree a regulation of its own. Under fifteen years of age the maximal retinal venous pressure is 28 mm. the minimum, 16 to 22 mm. Between fifteen and forty years of age the maximum and minimum are 34 and 20 mm. respectively; after forty years, 36 and 23 mm. The retinal arterial maximum and minimum under fifteen years of age are 68 and 40 mm.; after fifteen years 80 to 90 and 48 to 56. The very important ratio between the retinal arterial and venous pressure is between 1 to 1.9 and 1 to 3.0. The ratio of minimal retinal arterial to brachial is 1 to 1.4 or 1.5, and the ratio of maximal retinal arterial to brachial is 1 to 1.6. The extremely important capillary pressure can only be estimated by inference, but Sobanski, after considering all available evidence, believes it to vary between 33 and 55 mm. of Hg.

The diastolic venous pressure on the disc is a measure of intracranial pressure. In 98 cases the figure was correct within 4 percent error when the intraspinal pressure was under 250 mm. water and within 2.5 percent when it was greater than 250 mm. water. Choked disc develops when the relationship between the diastolic venous pressure and the retinal arterial pressure becomes abnormally high. Thus choked disc may be absent in increased intracranial pressure when the general blood pressure is high, and intracranial pressure which is only slightly increased may lead to early choked disc and rapid destruction of vision when the general arterial pressure is low. Mechanically, choked disc is explained by the fact that the pressure which is transmitted to the intervaginal space interferes with the outflow from the vena centralis unless the arterial pres-

sure is so high that it can maintain adequate circulation. When intraocular tension is low, choked disc may develop ex vacuo. At the other end of the scale of normal variation are cases of increased intraocular tension without glaucoma. Patients in this category observed by Lauber had a high general arterial pressure.

Systematic study of the blood-pressure relationship in cases of optic atrophy revealed low vascular pressure with normal intraocular tension, and more rapid destruction of visual function usually occurred when intraocular tension was high. An unfavorable influence of antiluetic treatment on tabetic optic atrophy is ascribed by Lauber to reduction in the blood pressure. When blood pressure was carefully controlled during specific treatment, visual function remained stationary or improved. In cases of optic atrophy, satisfactory therapeutic results were obtained by decreasing the intraocular tension, and where necessary the author has resorted to cyclo-dialysis, with gratifying results. Possibly the beneficial effect of surgical removal of the carotid sympathetic plexus, as described by Magitot, may be ascribed to its effect on pressure relationships. F. Herbert Haessler.

Riedl, F. Hereditary congenital atrophy of the optic nerve. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 332, (Ill.)

Through three generations congenital atrophy of the optic nerve was presumably inherited, with a typical clinical picture apart from irregular defects of the visual fields. There were no other pathologic symptoms, and roentgenograms of the sella gave no evidence of hypophyseal change.

C. Zimmermann.

Salzmann, Maximilian. Physiologic excavation and intercalary tissue. *Zeit. f. Augenh.*, 1935, v. 87, Aug., p. 1.

The details of the center of the disc are rather neglected in most of the commonly used atlases of ophthalmoscopy. Salzmann proposes to remedy this defect and also points out that intercalary tissue is sometimes visible ophthalmoscopically.

Salzmann suggests that the term "vascular portal" be used to denote the place where the central retinal vessels emerge in the depth of the lamina cribrosa. The fibers of the lamina coalesce with the extension of pial fibers and form a definite connective tissue ring which separates the central vessels from the nerve fibers. The intercalary tissue, which consists of a very loose mass of glial fibers, is only visible in a few eyes. When optical conditions are optimal it may be visible as a tiny grey dot in the whiter tissue of the vascular portal. Whether the gray spot in the paler tissue of the portal is indeed the ophthalmoscopic manifestation of intercalary tissue can only be demonstrated by ophthalmoscopic and anatomical study of the same eye. Salzmann has had this opportunity once.

F. Herbert Haessler.

Spector, S. A. and Chvorov, V. V. Ocular changes in Paget's disease. *Sovietskii Viestnik Opt.*, 1935, v. 6, p. 790.

After brief survey of the literature three cases are reported. The ocular changes are not characteristic, and the changes in the visual field are dependent upon exostoses and deformities of the orbit of the sella turcica. In optic atrophies of obscure etiology associated with bony deformities the possibility of Paget's disease should be taken into consideration. Ray K. Daily.

Vejdovsky, V. Optic nerve atrophy following rupture of acute lacrimal abscess into orbit. *Ceskoslovenska Oft.*, 1935, v. 2, no. 1, pp. 36-37.

A female aged thirty years had chronic dacryocystitis for three years. The acute abscess of two days' duration, from which pneumococci were isolated, ruptured into the orbit, causing severe cellulitis and abscess. Only after eight weeks were the drainage incisions healed. On entrance to the hospital the optic disc appeared normal, although vision was nil. Later the nerve became completely atrophied.

Georgiana Dvorak Theobald.

Volochov, A., Gerschuni, G., and others. Ocular chronaxia in diseases of

the optic nerve and retina. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 757.

The study was made on two eyes with macular lesions, three with retinitis pigmentosa, two with retrobulbar neuritis, one with retinal detachment, two with optic neuritis, one with choked disc, and two with postoperative anophthalmos. The findings show that the phosphene phenomenon produced by electric stimulation is due to the action of the neuroconducting portion of the visual pathway. The phenomenon was not altered by retinal lesions involving the neuroreceptive fibers; it was present following enucleation of an eye with light perception, and absent after enucleation of an eye with complete optic atrophy. The results are at variance with those reported by Best at the 1932 Leipzig meeting of the German Ophthalmological Society. Best failed to elicit the phosphene phenomenon in postoperative anophthalmos, because the optic nerve was under the influence of cocaine anesthesia.

Ray K. Daily.

12. VISUAL TRACTS AND CENTERS

Juba, Adolf. Anatomic investigations of lateral peripheral blindness and chronic alcoholic retrobulbar neuritis. *Klin. M. f. Augenh.*, 1935, v. 95, Aug., p. 148. (Ill.)

In a man of 34 years, affected by chronic alcoholism, the degeneration of the papillomacular bundle could be traced in the intracranial optic nerve, the chiasm, and the tract. Corresponding to former observations by Rönne and Juba, a localized atrophic dorso-central area was found in the external corpus geniculatum. This suggests projection of central vision in the external geniculate body. Both optic radiations showed symmetric fatty degeneration.

In a man of 48 years, whose right eyeball had been enucleated, both external geniculate bodies showed alternate atrophy of the lamellae so distributed that at the side with the optic atrophy the central, and contralaterally the peripheral, large and medium-large-celled strata were atrophic. As the pre-geniculate gray matter showed no change, the assumption of Hecht that

this nucleus does not belong to the primary optic centers proper is confirmed. The visual cortex was perfectly intact. C. Zimmermann.

Molina, T. Hemianopsia with transitory aphasia. *Arch. de Oft. de Buenos Aires*, 1935, v. 10, July, p. 552.

The author discusses the probable pathology and localization of a cerebral lesion initiated by xanthopsia in an alcoholic and luetic with right hemiparesis and Wernicke's sensory aphasia. He recovered first from verbal deafness, then from alexia through the stage of dyslexia, and also from apraxia. But he retained right homonymous hemianopsia and dyschromatopsia. The author argues for involvement of the posterior cerebral artery, or the deep parietal syndrome of Foix, rather than for an angular-gyrus syndrome.

M. Davidson.

Uriarte, A. B. Pupillary movements. A new theory on the pathogenesis of the Argyll Robertson sign. *Ann. d'Ocul.*, 1935, v. 172, Aug., pp. 672-687.

According to Uriarte's theory the normal photomotor pupillary reaction consists of dilatation in darkness rather than active contraction to light, absence of light being regarded as the stimulus. Thus loss of the photomotor reflex would show as absence of dilatation in the dark and would indicate a lesion involving the pupillary dilator rather than the sphincter. This explains the miosis and the preservation of contraction to convergence accompanying loss of the photomotor reflex. The theory is in accordance with the phylogenetic development of iris movements.

John C. Long.

Volochov, A., Gerschuni, G., and others. Ocular chronaxia in diseases of the optic nerve and retina. *Sovietskii Viestnik Opht.*, 1935, v. 6, pt. 6, p. 757. (See Section 11, Optic nerve and toxic amblyopias.)

13. EYEBALL AND ORBIT

Adamantiadis, B. Neuroma of the orbit. *Arch. d'Opht.*, 1935, v. 52, Aug., p. 582.

In 1929 a girl aged twelve years had hydatid cysts of the orbit, which ruptured through into the nose. (See Amer. Jour. Ophth., 1929, v. 12, p. 942.) Five years later she presented herself with a paralytic divergent strabismus. On palpation of the orbit a localized soft tender swelling was discovered just below the superior margin, and at exploration a tumor the size of a hazel nut was found adherent to the orbital margin. Histologically it was a true neuroma. The author explains it as arising from the cut end of a nerve, severed at the time of the first exploratory operation in 1929. (Illustrations.)

Derrick Vail.

Csapody, Istvan. A new plastic operation for lining the orbital cavity with a split flap. Zeit. f. Augenh., 1935, v. 87, Sept., p. 114.

To make a lining for the orbit, skin from a hairless portion of the arm is cut about a template; folded about a special piece of apparatus which resembles a lid retractor with a hemispherical capsule at the end of each arm; inserted into the orbit, from which cicatricial tissue, conjunctiva, and tarsus have been dissected; and sewed into place. With a Graefe knife the central horizontal strip is perforated by three rows of short horizontal incisions. This is the essential part of the operation. The sieve that is formed facilitates drainage, and it divides the flap into two parts so that when shrinkage takes place the flap has two centers of shrinkage, each of which coincides with a point of anchorage near the upper and lower orbital margin. F. Herbert Haessler.

Deggeller, Z. B. The correlation between syphilitic processes in the orbit and at the base of the brain. Sovietskii Viestnik Opht., 1935, v. 6, pt. 6, p. 796.

This is a tabulated report of eight cases with a symptom complex of various combinations of unilateral paralyses of the ocular nerves and trigeminal neuralgias. The clinical picture may culminate in complete ophthalmoplegia, caused by a luetic process in the roof of the orbit, or at the base of the brain close to the orbital fissure. The process frequently advances from behind for-

ward, that is from the base of the brain in the middle cranial fossa in the direction of the orbital fissure. The appearance of exophthalmos signifies orbital involvement. Ray K. Daily.

Gimenez Ruiz, R. Fibrohemangioma of the orbit. Arch. de Oft. Hisp.-Amer. 1935, v. 35, Sept., pp. 491-493.

Exophthalmos developed gradually during eight years, with gradual loss of vision, and final blindness. Exenteration of the orbit was performed and microscopic examination showed the tumor behind the eye to be a fibrohemangioma. (2 illustrations, bibliography.)

R. Castroviejo.

Havel, Jar. Bone formation atrophied globe. Ceskoslovensk 1935, v. 2, no. 1, pp. 51-53.

The left eye of a 71-year-old blind and atrophied after perforation with a stick at the age of five years, painful and irritated. Equatorial showed ossification of almost the whole uveal tract.

Georgiana-Dvorak Th.

Kalt, Marcel. Bilateral orbit with double exophthalmos. c. mercurial treatment. Arch. 1935, v. 52, Sept., p. 655.

Chronic inflammatory orbital tumors are relatively common, but it is rare that a bilateral and symmetrical case is observed. The author reports the case of a 35-year-old workman who complained of double exophthalmos of two months' duration, and bilateral corneal ulceration. Six months earlier he had noticed in the upper outer region of the left orbit a small indolent tumor which grew rapidly. A few weeks later the same event occurred in the right orbit. There was no associated pain. Examination showed marked bilateral proptosis and immovable globes. Both corneas were slightly ulcerated. All laboratory findings were negative. Biopsy, on the left side, showed a hard white tumor which did not bleed on sectioning. Histologically the tumor consisted of dense connective tissue, inflammatory islands, and vessels affected with endoperivasculitis. At the end of two months of treatment with intravenous mercury,

the tumor and exophthalmos disappeared from the right orbit, but the mass on the left side remained unchanged. The author believes this to be a case of syphilitic osteoperiostitis with sclerogummatous invasion of the orbit. (Illustrations, bibliography.)

Derrick Vail.

Patriarca, A. P. Brown-Séquard's ocular syndrome caused by acute mastoiditis. *Riv. Oto-Neuro-Oft.*, 1935, v. 12, March-April, pp. 284-287.

A man who had been affected for about a month by a right mastoiditis with profuse otorrhea and perforation of the drum showed the right lid apertures present larger than the left, and mydriasis of the eye with ligophthalmos of the same side. After enucleation after mastoidectomy the ocular optic atrophy disappeared. To explain the variance with ptomatic connection between the 1932 Leja affected organs the author as man *Ophth* at the inflammatory stimulus failed to elicit the pericarotid sympathetic in the upper part of the thin bony wall of the carotid canal. M. Lombardo.

W. M. de. Intermittent and pulsating exophthalmos and their therapy. *12. VISUAL-Neuro-Oft.*, 1935, v. 12, March-April, pp. 306-338.

The author reports three cases of exophthalmos of vascular origin following head trauma. The first, involving the left eye of a man of 48 years, was intermittent, manifesting itself in certain positions of the body, and was apparently due to orbital varices. The other two, involving respectively the left eye of a woman of 52 and the right eye of a man of thirty years, were pulsating, afebrile, and painless, and were accompanied by a murmur synchronous with cardiac movements. The author discusses pathogenesis, symptomatology, and treatment. (Bibliography, 10 figures.) M. Lombardo.

Saralegui, A. F. Pulsating exophthalmos. *La Semana Med.*, 1935, v. 42, June 27, pp. 1841-46.

A shot from a hunting rifle, accidentally fired, entered at the nasolateral fold and lodged, as subsequently shown by X ray, in the region of the sphenoi-

dal sinus and the cavernous sinus. A large bruit was noticed by the patient immediately after the accident. After failure of prolonged digital compression of the carotid vessels, the common carotid was tied, and at the same sitting the outer wall of the orbit was removed and first the superior branch of the ophthalmic vein and then the ophthalmic vein itself, which was as large as a little finger, were ligated. Upon ligation of the ophthalmic vein the patient exclaimed: "I no longer hear the noise." Exophthalmos persisted, but vision, which had previously been counting fingers at 50 cm., gradually rose to normal. (11 illustrations.)

W. H. Crisp.

Wheeler, J. M. Surgical correction of large coloboma of eyelid. *Trans. Western Ophth. Soc.*, 1st annual meeting, 1934, p. 75.

The author describes a method of closing defects in the lids by the use of a large skin flap from the temporal region. The flap is freed along its upper and lower edges and from the subcutaneous tissue and is drawn over the eyeball till the suitably prepared edges of the coloboma are brought into contact. The whole flap is then sutured in place with silk. The epithelial covering for the under side is obtained from the bulbar conjunctiva, which ultimately stretches and leaves no serious shortage of epithelium. The operation is completed by transplanting part of the cilia from the temporal part of the lower (or upper as the case may be) lid, to fill in the defect which is left in the lid margin when the flap is drawn to the nasal side.

George N. Hosford.

14. EYELIDS AND LACRIMAL APPARATUS

Anelli, Dante. The palpebral elastic fibers in the animal series. *Boll. d'Ocul.*, 1935, v. 14, Feb., pp. 202-224.

Examination of the lids of forty animals of different species showed the presence of elastic fibers in all. These usually form plexuses disposed around the openings of sebaceous glands and piliferous bulbs, or among the lobes of meibomian glands, or parallel with the

conjunctiva and the skin. In some animals they have a longitudinal direction on the anterior surface of the tarsus and a transverse on the conjunctival side. (Bibliography, 5 figures.)

M. Lombardo.

Busacca, A., and Maia, J. Chronic edema of the lids due to leishmania. *Folia Opth. Orientalia*, 1934, v. 1, Sept.-Dec., pp. 372-382.

The two cases reported arose in connection with leishmaniosis of the skin of the nose. The lid condition probably had a mechanical basis in the looseness of the subcutaneous tissue of the lid, with its proximity to the firmly attached skin of the nose. In one case, histologic examination showed signs of chronic inflammation with increase in connective tissue. Similar cases are cited from the literature. (References, 6 illustrations.)

W. H. Crisp.

Horner, W. D. A special clamp for holding lid sutures in lid operations. *Amer. Jour. Opth.*, 1935, v. 18, Oct., pp. 957-958.

Imre, J. Operation of senile ectropion. *Klin. M. f. Augenh.*, 1935, v. 95, Sept., p. 303. (Ill.)

This is a modification of the Kuhnt-Szymanowski method. By a skin incision 3 mm. below the lid margin, parallel and equal to the intermarginal section, and a vertical section at the temporal end joining both, a strip of skin is formed. After cutting out a triangle of conjunctiva and tarsus according to Kuhnt, a similar triangle of the skin below is removed. After suturing the margins of each triangle a superfluous strip remains, which is absconded, its temporal wound edges being carefully united. The sutures are removed after six days.

C. Zimmermann.

Ludwig, Alfred. Milker's nodule upon the upper eyelid. *Arch. f. Angenh.*, 1935, v. 109, Oct., p. 346.

The concurrence of a peculiar granulation at the lid margin of a milker, differing from all known lid affections, and of a cow-pox-infection nodule on his hand, suggested the same etiology

for both. The clinical course and the histological examination justified this assumption. Inclusion bodies could not be detected and inoculation experiments with the material from either source were negative. Vaccination of the patient at the time when the nodule was already healed was followed by a prompt reaction.

R. Grunfeld.

McKee, S. H. A study of the pneumococcus group from the inflamed conjunctiva and lacrimal sac. *Amer. Jour. Opth.*, 1935, v. 18, Nov., pp. 1021-1029.

Marquez. Value of conservative treatment of affections of lacrimal sacs. *Arch. de Oft. Hisp.-Amer.* vol. 35, Sept., pp. 455-459.

The author comments favorably on the article of Sáenz Alonzo (see p. 1021). Only when simple measures of syringing and probing fail ought one resort to dacryocystorhinostomy or excision of the sac.

R. Castro.

Miterstein, Bathia. Leishmaniasis of the lid. *Folia Opth. Orient.* v. 1, Sept. Dec., pp. 383-390.

Six cases of active ulceration and three cicatrized cases are reported. Discussion of the clinical picture, differential diagnosis, histology, and complications. Secondary infection is sometimes followed by ectropion. The infection is transmitted by the sandfly, *Phlebotomus papatasi*. The condition, which is commonly known as "oriental sore" and locally as "Jericho sore," has become more and more frequent in Palestine in recent years. The treatment consists of injections of neosalvarsan or antimonial preparations. (References, 7 illustrations.)

W. H. Crisp.

Perez Buñill. Dacryocystitis of the new-born. *Arch. de Oft. Hisp.-Amer.*, 1935, vol. 35, July, pp. 345-355.

After a few considerations on anatomy, embryology, and pathology, the author reports twenty cases of dacryocystitis in infants from eight days to thirteen months old. The author regards probing as the treatment of choice.

R. Castroviejo.

Riedl, Franz. Triple lower lacrimal punctum. *Zeit. f. Augenh.*, 1935, v. 87, Oct., p. 209.

The author describes a lower right lid with three lacrimal puncta. He could find in the literature only three other cases with more than two puncta in the lower lid. The anomaly is commoner in the upper lid. F. Herbert Haessler.

Rollin, J. L. The direction of the lid it in congenital lues. *Zeit. f. Augenh.*, 1935 v. 87, Sept., p. 104.

The author observed that the lid slit down and out in a large number of patients with congenital lues and without the disease. To demonstrate this, he has selected thirty representative photographs from his larger collection. F. Herbert Haessler.

Ophthalmic. J. Unusual course of a superotemporal lacrimal duct. *Ceskoslovensk. Oft.*, 1935, v. 2, no. 1, p. 37-39.

A forty-year-old patient had congenital epiphora and chronic conjunctivitis on the right side. Immediately after the internal canthal ligament was cut, a supernumerary duct was found and entered the sac. After the removal of this duct the lacrimation stopped and the conjunctival inflammation disappeared spontaneously.

Georgiana Dvorak Theobald.

Sáenz-Alonzo, R. Stricturotomy and probes of great caliber in treatment of the lacrimal passages. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, Sept., pp. 449-455.

An experience of six years has convinced the author that this treatment will in many cases give satisfactory results without resort to more complicated operations such as dacryocystorhinostomy. R. Castroviejo.

Soria, M. Crystals of cholesterol in the lacrimal sac. *Arch. de Oft. Hisp.-Amer.*, 1935, v. 35, Aug., pp. 435-438.

For chronic dacryocystitis of long standing, dacryocystectomy was performed, and microscopic study of the contents of the sac revealed the presence of a considerable number of small cholesterol crystals. R. Castroviejo.

Tichomirov, P. E. The use of strong solutions of silver nitrate in epiphora, according to the method of Vengrschenovskii. *Sovietskii Viestnik-Ophth.*, 1935, v. 6, pt. 6, p. 859.

Of six cases treated by the author according to Vengrschenovskii's technique (see below) three developed phlegmonous dacryocystitis. This demonstrates that the method is not free of danger and should be used with great caution. Ray K. Daily.

Vejdovsky, V. Optic nerve atrophy following rupture of acute lacrimal abscess into orbit. *Ceskoslovenska Oft.*, 1935, v. 2, no. 1, pp. 36-37. (See Section 11, Optic nerve and toxic amblyopias.)

Vengrschenovskii, G. S. The treatment of epiphora with a strong solution of silver nitrate. *Sovietskii Viestnik Ophth.*, 1935, v. 6, pt. 6, p. 850.

After detailed description of variations in the anatomic structure of the lacrimal sac the author describes his method of treatment of epiphora, which consists of instillation of a 5 to 10 percent silver nitrate solution, immediately neutralized with physiologic salt solution. The effect is of vasoconstriction, diminution in secretion and transudation, and moderate leucocytosis. Of 38 cases thus treated 82 percent made complete recovery. Ray K. Daily.

Von der Heydt, Robert. Ocular chalcosis. *Amer. Jour. Ophth.*, 1935, v. 18, Nov., pp. 1045-1047.

15. TUMORS

Borsellino, Gaspare. A case of pure subconjunctival lipoma. *Boll. d'Ocul.*, 1933, v. 14, April, pp. 517-525.

A girl of fifteen years showed a tumorlike formation at the temporal side of the right eyeball. The eye was very small for her years but had begun to grow rapidly at puberty. The growth was of the size of an almond, of pale pinkish color, was easily movable over the sclera, and had no adhesions with the conjunctiva. Histologic examination showed it to be a lipoma containing no ectodermal structures. The writer thinks that lipoma represents a well de-

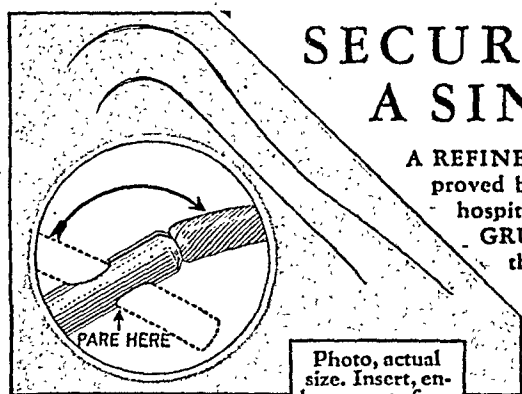
Happy New Year



1936 has been an extremely satisfactory and successful year for Soft-Lite, thanks to the co-operation of Soft-Lite Distributors and Licensees. In grateful appreciation, the officers and representatives of the Soft-Lite Lens Company, Inc. take this opportunity of wishing all their friends a joyful holiday season and continued success and prosperity in 1937.

SOFT-LITE LENS COMPANY, INC.

The GRÜSS Rethreadable NEEDLE



SECURELY HOLDS A SINGLE SUTURE

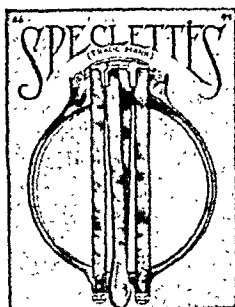
A REFINEMENT IN SURGICAL SUTURING. Perfection proved by two years' use in leading American and European hospitals. Ordered and re-ordered by world-famed surgeons. GRÜSS Needles, fully patented, are the only instruments of their kind. Reduce trauma to a minimum. Rethreadable; can be used indefinitely... Types and sizes for all uses, all sutures.

TRIAL OFFER

Write for 1 doz. needles on approval; also a card of our No. 1 eye silk. If not returned in 30 days we will mail bill...

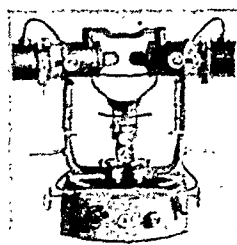
FOR FURTHER INFORMATION, WRITE
GRÜSS SURGICAL MFG. CO.
163 SECOND STREET, SAN FRANCISCO, CALIFORNIA

Photo, actual size. Insert, enlargement of eye



Pat. Nos.
236271/24
322207/23

LONDON ENGLAND
THEODORE HAMBLIN, LTD.
DISPENSING OPTICIANS (EXCLUSIVELY)
15 WIGMORE STREET, LONDON W.1.

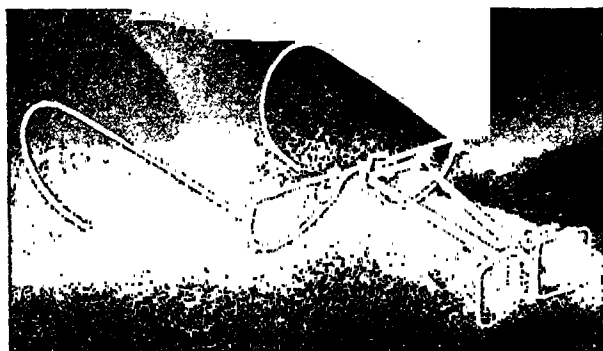


THE PUGH
ORTHOPTOSCOPE
The most
modern apparatus
for orthoptic training

PATENTEES OF
"SPECLETTES"
THE POPULAR FOLDING SPECTACLES
MADE FOR THE AMERICAN MARKET BY

The May Manufacturing Co., Inc., 146 West 29th St., New York

Spectacles of Individuality



May Loupe Spec

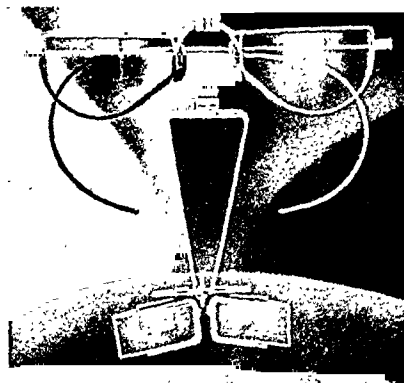
A LOUPE that can be detached at bridge point.

The prism holder can be raised up when not in use and remain out of line of vision.
Can be sterilized.

Made in White Gold Filled.

Can be supplied in the different eye-sizes and P.D.'s

If your jobber cannot supply them, order direct.



PAT. APPLIED FOR

MAY MANUFACTURING CO., 146 West 29th Street, NEW YORK

AMERICAN JOURNAL OF OPHTHALMOLOGY

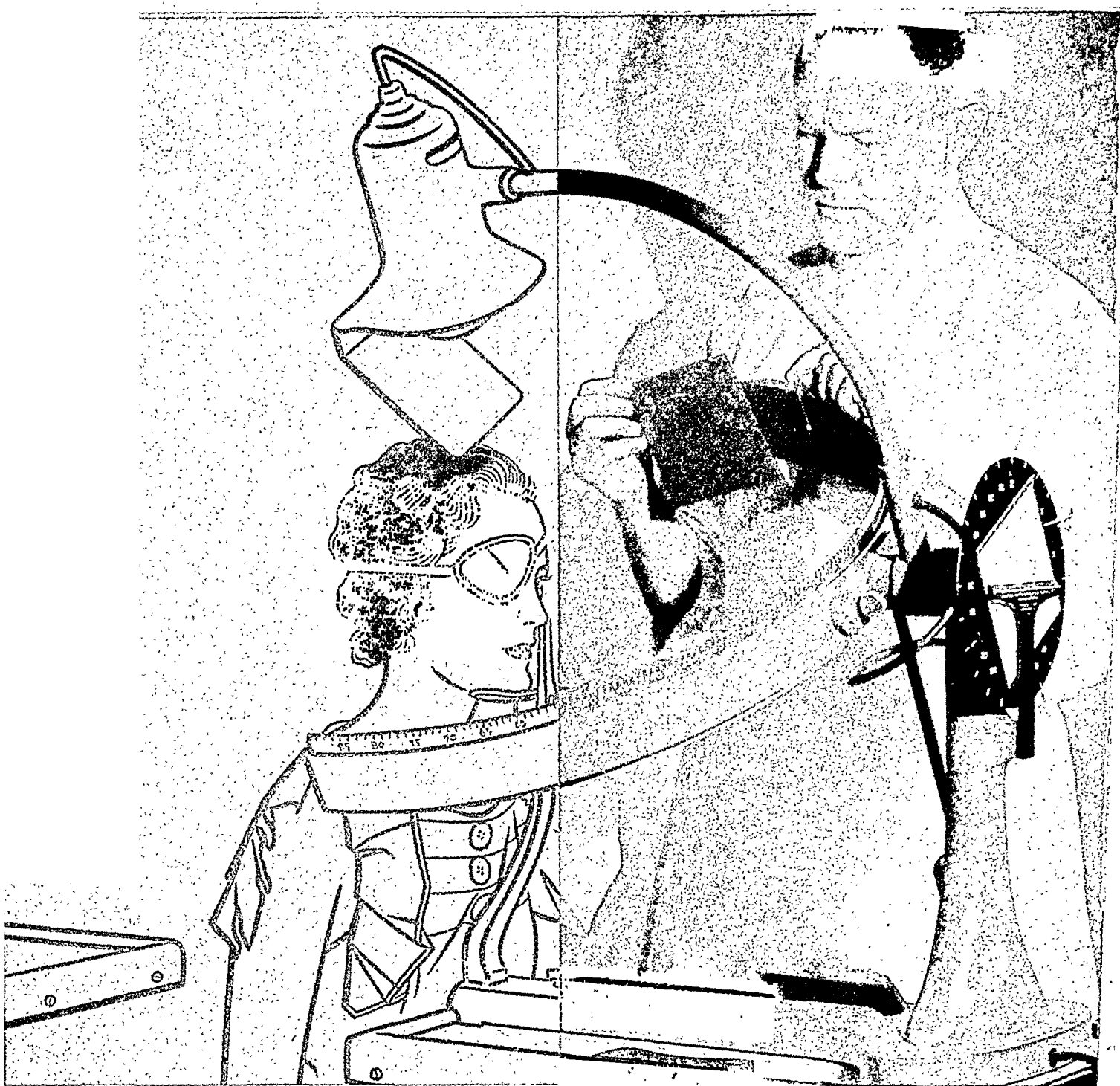
SERIES 3, Vol. 19, No. 12

DECEMBER, 1936

CONTENTS

Frontispiece, plate illustrating paper by Dr. Wetzel

Original Papers	Page
Aneurysm of the internal carotid artery with atrophy and compression of the optic nerve. John O. Wetzel	1053
Iritis produced in rabbits' eyes by the intravenous injection of crude and purified cultures of bacteria isolated from patients with certain inflammatory eye diseases. Conrad Berens, Edith L. Nilson, and George H. Chapman ..	1060
Tobacco amblyopia; alcohol amblyopia. Frank D. Carroll and C. Ray Franklin ..	1070
Results of the surgery of glaucoma. Louis Bothman and Marvin J. Blaess ..	1072
Ocular changes in multiple sclerosis. Don Marshall and R. G. Laird	1085
Glaucoma in amblyopia. Samuel V. Abraham	1094
The role of paracentesis in ophthalmology. William F. Hardy	1097
Unilateral congenital anophthalmos with orbitopalpebral cyst. Morris Rosenbaum	1101
Notes, Cases, Instruments	
Diathermy in cataract extraction. Theodore L. Terry	1105
Apparent increase of hyperopia up to the age of nine years. E. V. L. Brown ..	1106
Case of marked exotropia treated with strong concave lenses. Maurice L. Greene	1106
Society Proceedings	
College of Physicians of Philadelphia, Section on Ophthalmology, February 20, 1936	1109
Minnesota Academy of Ophthalmology and Otolaryngology, Section on Ophthalmology, February 14, 1936	1111
New England Ophthalmological Society, March 17, 1936	1111
Washington, D.C., Ophthalmological Society, March 2, 1936	1113
Memphis Society of Ophthalmology and Otolaryngology, March 10, 1936..	1114
Editorials	
Consecutive extraction of lens and capsule	1116
The screen parallax for orthoptic training	1117
The Teachers' Section of the Academy	1118
Book Notices	
Detachment of the retina and its treatment	1119
Polychromatic plates for color-sense examination	1120
Correspondence	
Quackery in ophthalmology	1121
Abstract Department	
General methods of diagnosis; Therapeutics and operations; Physiologic optics, refraction, and color vision; Ocular movements; Conjunctiva; Cornea and sclera; Uveal tract, sympathetic disease and aqueous humor; Glaucoma and ocular tension; Crystalline lens; Retina and vitreous; Optic nerve and toxic amblyopias; Visual tracts and centers; Eyeball and orbit; Eyelids and lacrimal apparatus	1122
News Items	1146
Index for Volume 19	i



COLOR AND FORM FIELD *analyses*

Simplicity of design and operation feature the new Bausch & Lomb Simplified Ferree-Rand Perimeter, an instrument designed for charting accurate perimetric and campimetric fields. Peripheral fields and central fields can now be taken under identical conditions—and irregularities between the two fields that occur when charted on different instruments are now eliminated.



A standard of illumination—7 foot candles—is secured by a lamp fitted with daylight filter which is fixed to the perimeter arm and moves with it, so that illumination in all meridians is always maintained at a constant.

An important aid for rapid recording of accurate field measurements is its semi-self recording feature. Ask your wholesaler for descriptive literature.

BAUSCH & LOM

OPTICAL COMPANY , , ROCHESTER, N.

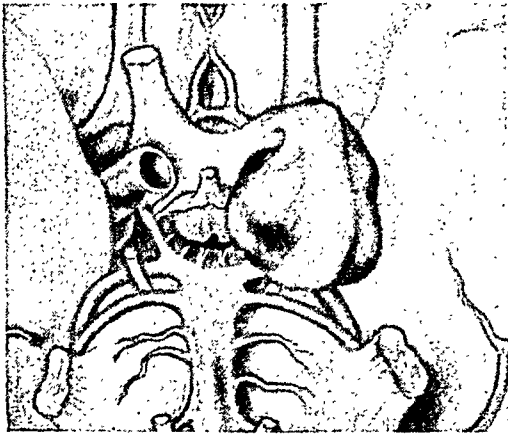
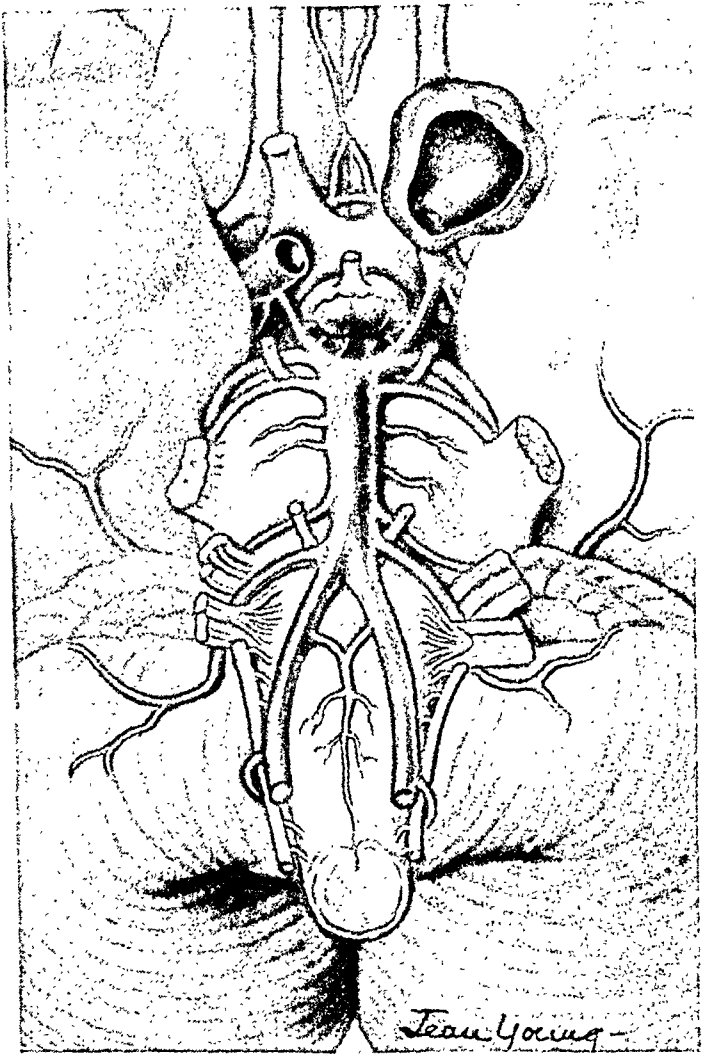


FIG. 5 (WETZEL). ANEURYSM OF THE INTERNAL CAROTID ARTERY.

ANEURYSM OF THE INTERNAL CAROTID ARTERY WITH
ATROPHY AND COMPRESSION OF THE
OPTIC NERVEJOHN O. WETZEL, M.D.
LANSING, MICHIGAN

A patient who complained of failing of vision in the left eye and pains in the left side of the head was observed at intervals over the course of one year. Fundus examination showed, on the left side, secondary optic atrophy, increase of connective tissue on the nerve head, and progressive atrophic excavation of the nerve head. Visual-field studies revealed progressive contraction for form in the left eye. Death occurred in coma shortly after a sudden attack of severe headache. Autopsy showed leptomenigeal and cortical hemorrhage and an aneurysm of the left internal carotid artery, over the surface of which was stretched the flattened and partially degenerated left optic nerve. There were evidences of renal and vascular disease, and no evidence of syphilis.

Recent opinion gives arteriosclerosis and bacterial infection, especially progressive malignant endocarditis, acting on a congenitally weak vessel wall, as the most frequent causes of aneurysm. A review of the finer anatomy of the region suggests the mode of action by which aneurysm of the internal carotid artery may compress the optic nerve and bring about its atrophy.

Clinical diagnosis before rupture of the aneurysm is rare. The clinical picture varies widely with the rate of development of the aneurysm.

Cases of aneurysm of the internal carotid artery producing pressure changes in the optic nerve appear to be sufficiently rare to merit full reporting. In 1929 Albright¹ collected 30 cases of aneurysms at or near the junction of the internal carotid artery and the circle of Willis, giving rise to symptoms and verified at autopsy or operation, and added two personal cases. In 1934 McKinney² reviewed the literature since 1850 and found 22 cases of aneurysm of the intracranial portion of the internal carotid artery confirmed at autopsy or operation or by definite X-ray findings. Woods and Rowland³ found that of 138 cases of optic-nerve disease, 1.5 percent were due to intracranial aneurysm. Saphir⁴ noted that Michel, in 1877, was probably the first to describe changes in the optic nerve due to compression by a diseased carotid artery. In a case with the clinical diagnosis of edema of the papilla, dilated or markedly tortuous internal carotid arteries were revealed which pressed upon the optic nerves. Histologically, Michel records that there were found hyperemia and diffuse round-cell infil-

tration of the optic nerves with preservation of the nerve fibers.

The case that I have to report is as follows:

On October 26, 1932, Mrs. E. H. H., aged 39 years, a housewife, complained of failing vision of the left eye. She had noticed that vision was failing two years before the time of her first visit. The family history was irrelevant. She had always been well prior to the time of her last pregnancy, nine years ago, and dated most of her ocular complaint from that time.

The ocular examination showed that vision in the right eye was 6/7.5 plus and in the left 6/60. The external ocular structures were normal as was also the fundus of the right eye; that of the left eye showed a secondary optic atrophy. Perivascularitis was noted in places in the nasal portion of the retina. Field studies were made (fig. 1). The intraocular tension was 19 mm. (Schiotz) in each eye. The patient was sent to the hospital for a general physical examination. Blood pressure was 180 systolic and 110 diastolic. The blood count was

normal. Urinalysis showed three-plus albumin. The Kahn reaction of the blood was negative. Several teeth showed evidence of infection. The tonsillar stumps revealed infection and there was an infected mass of adenoid tissue in the nasopharynx. A roentgenogram of the region of the sella turcica showed normal outlines of the sella and no erosion of the clinoid processes.

The infected teeth, tonsillar stumps, and adenoid tissue in the nasopharynx were removed.

On January 2, 1933, the patient returned because of severe pain in the left side of the head. Corrected vision in the right eye was 6/5; in the left eye 6/60, blurred. There was no evidence of any recent extraocular disturbance. The findings on fundus examination were practically the same as on the previous visit. Another medical survey was made, and this and the neurological examination which followed failed to shed any light on the cause of the headaches. The Kahn test of the spinal fluid was negative. A visual-field study (fig. 2) showed a greater contraction for form in the left eye than did the study made on the first visit.

The patient visited relatives in a distant state and was not seen again until August 24th. At that time the uncorrected vision in the right eye was 6/7.5; in the left eye finger counting at 0.60 meter. The findings on external examination were essentially the same as on the previous visits. Fundus examination of the right eye showed no change from the previous visit. Examination of the left eye showed an increase in connective-tissue deposit on the nerve head. The atrophic excavation of the nerve head was more pronounced and the mottling of the fibers of the lamina cribrosa could be seen plainly. The pain in the patient's head was less severe.

On October 23, 1933, the patient appeared to be in her usual state of health, but after eating her dinner she complained of a sudden severe headache, lapsed into coma, and died within an hour.

The necropsy report on the head was as follows:

Brain: Extensive hemorrhage in the

leptomeninges, spreading over the cortex of both the cerebrum and cerebellum.

Dura mater: Negative.

Medulla: Meningeal hemorrhage. Edema.

Pituitary body: Pressure atrophy. Eosinophile cells in excess over basophiles.

Right optic nerve: No lesion.

Left optic nerve: The left optic nerve was disposed as a much stretched and flattened ribbon over the surface of an aneurysm of the left internal carotid artery. In the least-flattened portion there were many myelinated nerve fibers, but in the thinner part there was nearly complete degeneration, only the stromal elements persisting.

Aneurysm of the left internal carotid artery: The artery wall was greatly thinned and in part was without the usual musculature and elastic layers. There was a well-marked productive inflammation of the intima. Evidence of syphilitic arteritis was absent.

Little cerebral artery: Lumen dilated. Wall somewhat thinned. No other lesion.

A summary of the changes found elsewhere in the body is as follows: Slight atherosclerosis of the aorta. Subepicardial fatty infiltration. Slight subendocardial degenerative fatty infiltration. Hypertrophy and patchy-brown atrophy of the heart muscle, and slight myocardial fibrosis. Acute passive congestion of the lungs with hemorrhage by diapedesis. Slight atrophy of the liver, with cloudy swelling, passive congestion, and patchy interlobular cirrhosis. Advanced nephropathia arteriosclerotica. Primary contracted kidney. Active renal inflammatory foci. Lipoidosis of the epithelium in occasional renal tubules. Moderate atrophy with hypoplasia of the adrenals, with cortical lipoidosis. Passive congestion of the spleen. Iodized-Graves's-constitution thyroid with adenoma. Hyperplastic thymus with old tuberculosis. Old recurrent appendicitis.

The pathologist remarked: "This aneurysm would seem to depend for its etiology upon the combined vascular and renal disease. Was this patient not

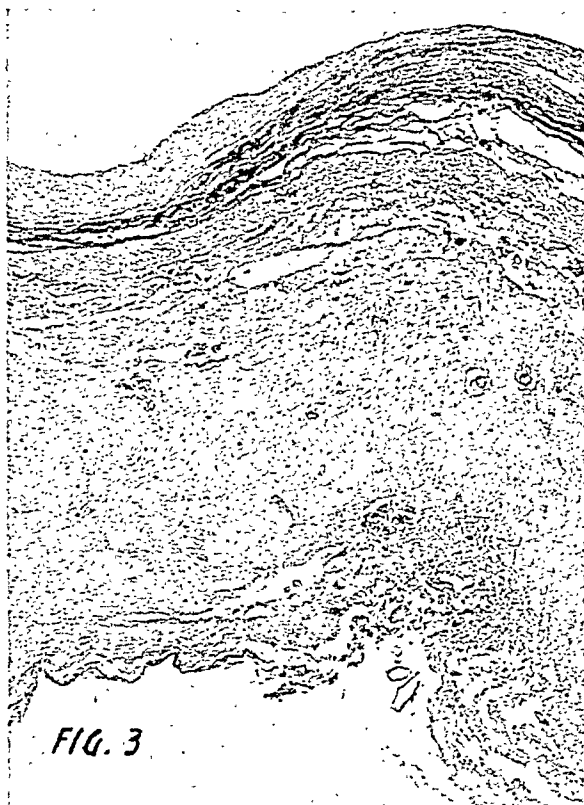
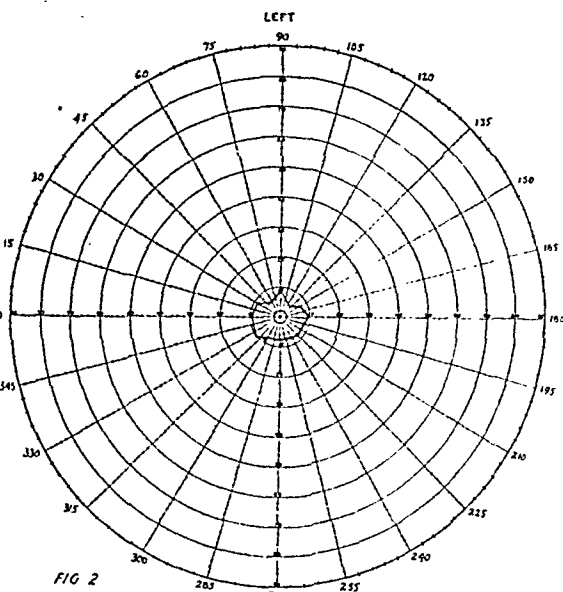
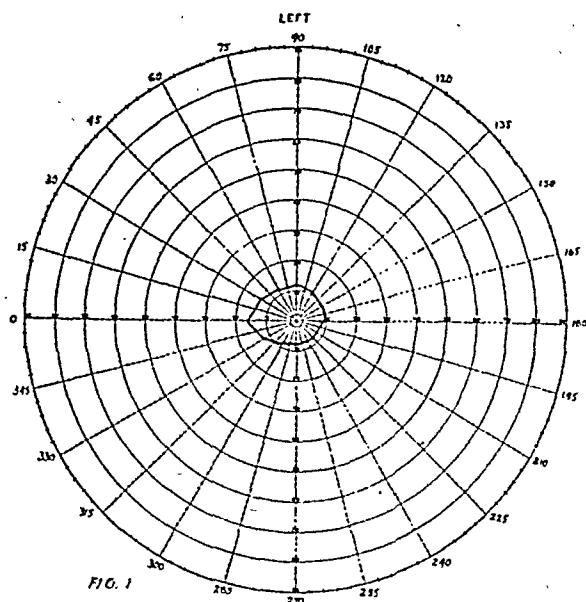


Fig. 1 (Wetzel). Left field as of October 26, 1932.

Fig. 2 (Wetzel). Left field as of January 2, 1933, showing greater contraction for form.

Fig. 3 (Wetzel). Photomicrograph of the wall of the aneurysm with left optic nerve. Phosphotungstic acid hematoxylin preparation, $\times 22$.

Fig. 4 (Wetzel). Photomicrograph of left optic nerve. Phosphotungstic acid hematoxylin preparation, $\times 270$.

hypertensive at one time? While syphilitic etiology is always suspected in these cases, the only suggestions of syphilis in this patient are the slight

interlobular cirrhosis and the plasma-cell infiltrations in the adrenal medulla. These are not sufficient for a diagnosis of lues."

The microscopic pictures of the wall of the aneurysm and of the optic nerves are shown in figures 3 and 4.

Garvey⁵ stated that the most frequent cause of degeneration of the vessel walls leading to aneurysm is arteriosclerosis and that this is often a patchy disease, detectable only by careful microscopic examination. The next most frequent cause he found to be bacterial infection, especially progressive malignant endocarditis, with impaction of emboli in the lumen. He ascribed a minor role to syphilis. Trauma is a frequent cause of arteriovenous aneurysm in the cranium, but is seldom a cause of the type of aneurysm here under discussion.

Moore⁶ reported a case of "mycotic aneurysm" described at necropsy as being in the right ophthalmic artery and probably involving the end of the internal carotid and the beginnings of the anterior cerebral and posterior communicating arteries. The patient had malignant endocarditis. Following a sudden, severe frontal headache, he woke to find himself totally blind in the right eye. The fundus was essentially normal and there was no positive evidence of retrobulbar neuritis. Several days later a defect of the upper temporal field of the right eye was noted. It was thought that the explanation must lie in compression of the optic nerve somewhere in front of the optic chiasm, and an aneurysm was suspected. This case was most unusual, in that the optic nerve was found completely ruptured. In Moore's opinion the embolus lodged in the artery at the time of the sudden pain in the head and the rupture of the nerve is explained by the suddenness of the stretching to which it was subjected by the rapid development of the aneurysm. When stretching of the nerve takes place slowly, as in the case of a slowly developing pituitary tumor or a gradual dilatation of a weakened vessel, the nerve is thinned and flattened, but will undergo extreme distortion and elongation without rupture. The fact that what we term pressure on the nerve is frequently in these cases more prop-

erly stretching of the nerve was emphasized by Paton.⁷ The nerve is lifted by the aneurysm and carried on its surface, where it is subjected to the combination of pressure and traction. This was the situation in our case (fig. 5).

Congenital weakness of the vessel walls is at least a predisposing factor of aneurysm, but it may be that arteriosclerotic disease of the vessel is necessary for the development of aneurysm in the predisposed wall. Congenital defects in the medial wall of a vessel are most often found at points where the vessel divides, and it is at such points that we find most commonly an aneurysm of the internal carotid. Other congenital abnormalities are sometimes noted. Thus, one of Albright's¹ patients had a deformity of the left hand, with which he had been born; certain of the terminal phalanges appeared to be missing. Necropsy showed on the right side a small aneurysmal sac, the mouth of which opened into the middle cerebral artery very close to its origin from the carotid. A very small branch, probably one of the anterior lateral ganglionic branches, opened from the middle cerebral artery just at the orifice of the aneurysmal sac. It is difficult to determine whether the sac really rose from the middle cerebral or from this smaller branch. On the left side there was another sac apparently arising from a symmetrical position. This sac had ruptured, forming a false aneurysm. The left third nerve was flattened out on the surface of the sac.

A clear idea of the finer anatomy of the course of the optic nerve as it approaches the circle of Willis and of the intimate relations of the vessels of this region to the optic nerve is helpful in understanding the mode of action of the aneurysm in compressing the nerve. According to Favaloro⁸ we have here a "true zone of peril." The optic nerve rests, inferiorly, on the internal carotid artery at the point at which the latter forms an arch with convexity upward and gives origin to the ophthalmic artery. The roof of the optic canal is prolonged backward by a firm membranous fold of the dura mater, and for this reason the optic nerve at this

point is susceptible of compression when the course and curvature of the carotid and ophthalmic arteries are modified by atheromatous changes and still more when the atheromatous changes of the vessel walls have been followed by aneurysm (Gabardi⁹). In all of Saphir's⁴ six cases of arteriosclerosis of the internal carotid artery, with aneurysm in four, the optic nerves showed pressure marks in just this region. Löwenstein¹⁰ mentioned three dangerous areas, pointing out that the researches of Liebrecht, of Bernheimer, and of Otto have demonstrated that pressure by the sclerotic vessel does not take effect in the bony canal, but in the continuation of this canal toward the cranial cavity. Here, where the ophthalmic artery "bores longitudinally into the optic nerve," he sees the first point of danger. The second is the sharp upper edge of the fibrous canal as it runs toward the cranial cavity, against which the ascending carotid squeezes the optic nerve. The third point of danger lies between the canal and the chiasm, where the carotid and the anterior cerebral arteries cross below and above the optic nerve. The pressure, Löwenstein insisted, is always from the carotid and never from the ophthalmic artery.

A few more words may be given to the role of the ophthalmic artery in respect to lesions of the optic nerve. The most marked changes have been observed at the level of the arch of the carotid where the ophthalmic artery branches off. But numerous necropsy reports show only the dilated carotid artery exerting direct pressure on the nerve and this only in the membranous portion of the canal. Within the canal, moreover, the ophthalmic artery is enveloped in folds of the dura mater, which, being fibrous and inelastic, would not permit the artery to press upon the nerve. But in the pathogenesis of lesions of the optic nerve, one may well take into account the fact that sclerotic changes in the ophthalmic artery might be able to determine nutritional disturbances of this nerve, with atrophy as the end result. Gabardi,⁹ who discusses this matter at some

length, is of the opinion that compressive and nutritive factors are associated in the determination of the optic-nerve lesions.

A possible secondary pressure factor is mentioned by Saphir. He noted hyperemia of the small veins in the superficial portion of the nerve in some of his cases of changes in the optic nerve resulting from pressure of arteriosclerotic internal carotid arteries. This hyperemia, indicative of impaired venous return, might, he thought, constitute an additional pressure phenomenon.

Aneurysm of the internal carotid artery is rarely diagnosed *intra vitam* and prior to rupture as the cause of an atrophy of the optic nerve. Considerable gross change in the nerve is compatible with very slight functional disturbance. Saphir was surprised at the discrepancy between the gross and the microscopic changes in the nerves in his six cases. These changes were necropsy findings; the patients had made no complaints relative to the eyes. On the basis of six cases studied at the eye clinic of the University of Bologna, Gabardi¹¹ stated that there is no characteristic nor pathognomonic syndrome for aneurysm or calcification of the intracranial portion of the internal carotid, but there are ophthalmoscopic and field-measurement findings which suggest the correct diagnosis. Gabardi described two ophthalmoscopic pictures; in the first, temporal pallor of the papilla, total pallor, and accentuated pseudoglaucomatous excavation; in the second picture, which is found in a minority of cases, there is papillary stasis or its end results (post-papillitic atrophy). He ascribed the difference to the mode in which the compression becomes stabilized. If the compression occurs rapidly and in the portion of the optic nerve corresponding to the entrance into the canal, the sudden obstruction to the blood and lymph circulation in the nerve will give rise to a picture of stasis more or less marked. When, on the other hand, compression is exerted slowly, we have the picture of atrophy.

Beside the changes in the optic disc (stasis, or primary or secondary atro-

phy), Gabardi would have the observer look for vascular lesions—retinal hemorrhages and thinness of the arterial vessels. A study of the visual fields to detect contractions should be added. On the basis of this entire complex of symptoms Gabardi was able to make a hypothetical clinical diagnosis in one of his cases.

Radiography may be used for confirmation. If there is calcification in the walls of the aneurysm, this will show. When the aneurysm is large, the differential diagnosis may be impossible and the difficulties are increased when the visual disturbances date from far back and no reliable reports of early findings are available. In such cases the campimetric and ophthalmoscopic changes produced by the aneurysm could be indistinguishable from those produced by a tumor of the pituitary. Cavina¹² observed a case in which an aneurysm first compressed the optic nerve of the side of the lesion and then, crossing midline, involved the contralateral optic nerve, producing a temporal hemianopsia on this side. Macular lesions, not uncommon, aid in diagnosis only when associated with ophthalmoscopic changes in the optic nerve and with changes in the peripheral limits of the visual fields. They are indirect, rather than direct, consequences of compression on the part of the artery.

Practically every type of visual-field defect has been reported in cases of aneurysm of the internal carotid artery. Defects of the visual field on the nasal side are readily explained. The optic-nerve fibers lying outwardly in the chiasm, according to Henschen,¹³ supply the temporal half of the retina, the lower-lying fibers supplying the lower quadrant, the higher-lying fibers the upper quadrant. But it is more difficult to explain a central scotoma, which has often been reported. The old, and apparently still the only, explanation is that the papillomacular bundle, as most highly differentiated, sustains pressure less well than the more primitive peripheral bundles. Löwenstein, who examined early cases, thinks that rapid progress of the visual-field defect, with, it may be, appearance of a choked disc

and a large central scotoma, speaks for pressure by an aneurysm of the carotid, whereas defect for color in the nasal field without central scotoma and progressing slowly, with the ophthalmoscopic picture of a beginning simple atrophy of the optic nerve, suggests rather an atheromatosis of the carotid.

When aneurysm of the internal carotid artery ruptures, there is usually an apoplectic attack, with loss of consciousness and vomiting. Death may ensue before consciousness is regained. In other cases, with only small perforations in the aneurysmal sac, there is slow leakage, with time for the development of a train of symptoms. The rupture may give rise to a pseudoaneurysm of large dimensions, producing symptoms of rapid compression of the optic nerve. It is these large pseudoaneurysms that are most likely to give rise to the so-called "neighborhood signs," from direct pressure on neighboring structures, shooting pains over the upper portion of the face, ptosis, diplopia, and impairment of vision (Garvey).

The neighborhood signs were well summed up by Bartholow in 1872 who is quoted by Albright as follows: "Aneurysm of the internal carotid will affect the sense of smell by compression of the olfactory nerve; will also cause ptosis, convergent strabismus, and a dilated pupil by pressure on the motor oculi; will cause congestion of the eye and swelling of the veins of the face by compression of the cavernous sinus; and will be accompanied by intense *tic douloureux*, especially in the ophthalmic division, due to irritation of the fifth nerve. With the growth of the tumor, especially if that part of the artery within the carotid canal be involved, there will be noises, pulsating in character, in the ear, followed by impaired hearing, and finally by complete deafness. The facial nerve may also become involved, and paralysis of the face on the same side will be observed. Softening of the neighboring part of the middle lobe will take place, and, by reason of this, or by pressure on the *crus cerebri*, crossed hemiplegia will occur."

If the leakage from the artery does

not become encapsulated in a pseudo-aneurysmal sac, there will develop the usual symptoms of meningeal irritation, pain in the back of the neck, stiffness of the neck, and Kernig's sign.

Up to the present time, as has been said, the condition has seldom been diagnosed before rupture, partial or complete. With earlier diagnosis, should closer study of early symptoms make this feasible, it is possible that some patients might be helped by ligation of the common carotid artery. Ligation does not remove the aneurysm, but reduces the fullness and hence diminishes pressure.

Before closing brief mention might be made of a curious case reported by Trevani,¹⁴ in which an aneurysm of

the internal carotid artery was mistaken at operation for a parasellar tumor. The aneurysm had become organized. It presented a nodular mass measuring $5 \times 4 \times 3$ cm., over which ran the greatly flattened optic nerve. On section, the tumor consisted of grayish white layers concentrically arranged and containing fresh coagula only in the center. The right internal carotid communicated with the central cavity of the tumor at its point of exit from the cavernous sinus, the connecting bridge being of pinhead size. The patient had been almost completely blind for a year. The aneurysm in Trevani's case would appear to have been of syphilitic origin.

1912 Olds Tower.

References

- ¹ Albright, F. The syndrome produced by aneurysm at or near the junction of the internal carotid artery and the circle of Willis. *Bull. Johns Hopkins Hosp.*, 1929, v. 44, April, p. 215.
- ² McKinney, J. McD., Acree, T., and Soltz, S. E. The syndrome of the aneurysms of the intracranial portion of the internal carotid artery. *Trans. Amer. Neur. Assoc.*, 1934, v. 60, p. 201.
- ³ Woods, A. C., and Rowland, W. M. An etiologic study of a series of optic neuropathies. *Jour. Amer. Med. Assoc.*, 1931, v. 97, Aug. 8, p. 375.
- ⁴ Saphir, O. Changes in the optic nerve resulting from pressure of arteriosclerotic internal carotid arteries. *Amer. Jour. Ophth.*, 1933, ser. 3, v. 16, Feb., p. 110.
- ⁵ Garvey, P. H. Aneurysms of the circle of Willis. *Arch. of Ophth.*, 1934, v. 11, June, p. 1032.
- ⁶ Moore, R. F. A case of unruptured intracranial aneurysm which had caused rupture of the optic nerve, diagnosed during life. *Trans. Ophth. Soc. U. Kingdom*, 1926 (Session 1925), v. 45, pt. 2, p. 490.
- ⁷ Paton, L. Classification of the optic atrophies. *Proc. Roy. Soc. Med., Sect. Neurol.*, 1930, v. 24, Nov., p. 1.
- ⁸ Favaloro, G. I. Ricerche di morfologia clinica sulla regione delle vie ottiche e dell'ipofiso negli stadi fetali e nell'adulto. II. Sulla patogenesi delle affezioni delle vie ottiche con particolare riguardo alle affezioni da compressione. *Ann. di Ottal.*, 1929, v. 57, p. 354.
- ⁹ Gabardi, E. F. Contributo alla diagnostica delle lesioni chiasmatiche da alterazioni della carotide interna. *Bull. d. Sci. med.*, 1934, ser. 9, v. 2, July-August, p. 267.
- ¹⁰ Löwenstein, A. Sehnervenschwund mit binasaler Hemianopsie durch Atheromdruck basaler Hirngefäße. *Med. Klin.*, 1935, v. 31, Feb. 8, p. 176.
- ¹¹ Gabardi, E. F. Ulteriore contributo clinico alla conoscenza delle sindromi oculari da alterazioni delle carotide interne. *Riv. Oto-Neuro-Chir.*, 1934, v. 11, November-December, p. 591.
- ¹² Cavina. Cited by Gabardi (11).
- ¹³ Henschen. Cited by Löwenstein (10).
- ¹⁴ Trevani, E. Ein als parasellarer Tumor operiertes Aneurysma der Arteria carotis interna. *Zeit. f. Chir.*, 1932, v. 237, p. 534.

IRITIS PRODUCED IN RABBITS' EYES BY THE INTRAVENOUS INJECTION OF CRUDE AND PURIFIED CULTURES OF BACTERIA ISOLATED FROM PATIENTS WITH CERTAIN INFLAMMATORY EYE DISEASES

Preliminary report

CONRAD BERENS, M.D., EDITH L. NILSON, AND GEORGE H. CHAPMAN
NEW YORK

Iritis was produced in rabbits by the intravenous injection of either primary or purified cultures from 19 to 21 patients with acute or chronic eye diseases, and in 11 of 14 controls (laboratory assistants, healthy children, and patients with arthritis and thyrotoxicosis).

Positive results were obtained with various microorganisms as follows: streptococci (alpha, beta, and gamma types), staphylococci (albus and aureus), colon bacilli, non-lactose fermenters, enterococci, and Friedländer bacilli.

Iritis was produced by 44 percent of 61 purified strains of streptococci from patients with eye disease as compared with 29 percent of 69 strains from persons in the control group.

Of the total of 134 cultures from patients with eye disease, 36 percent produced iritis while 17.9 percent were undetermined. Of the total of 118 cultures from persons in the control group, 29.2 percent produced iritis in rabbits, while 21.5 percent were undetermined. From the Lighthouse Eye Clinic of the New York Association for the Blind, and the Clinical Research Laboratory. Aided by grants from the Ophthalmological Foundation, Inc. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936.

Because of the possible importance of the relation of focal infection to the etiology of many acute and chronic eye diseases, a knowledge of the relationship of microorganisms to the production of ocular lesions is of vital importance. The impracticability of inoculating human volunteers has made it necessary to study this problem by means of animal experimentation. Rabbits are susceptible to the pathogenic action of many bacterial species and are less expensive than primates. Therefore, they have been used extensively, even though positive findings cannot be considered conclusive evidence of a parallel relationship to ocular disease in man.

In 1932, Rosenow and Nickel¹ summarized a series of experiments previously published by them and their associates on the elective localizing power in rabbits of freshly isolated streptococci and pneumococci derived from foci of infection of patients with various diseases. (The lesions produced in their earlier experiments had occurred only after several passages through animals of "laboratory" strains of these organisms.) They also reported a new series of experiments, following a somewhat similar method, in which iritis

was produced by direct inoculation of primary cultures from patients suffering from acute, chronic, primary, or recurring attacks of iritis, uveitis, or iridocyclitis.

This report and the results of other investigations, such as those of Maestro,² Zanettin,^{3, 4} Blanc and Martin,⁵ Cusumano,⁶ Wherry and King,⁷ de Andrade,⁸ von Herrenschwand,⁹ Brown,^{10, 11} Irons, Brown and Nadler,¹² Meisser and Gardner,¹³ and Haden¹⁴ stimulated the experiments to be described in this paper.

Experimental procedure

A series of patients with acute and chronic inflammatory eye diseases was studied bacteriologically. Because previous experiments had indicated that the nose and throat, even though symptomless,¹⁵ were the foci most frequently involved in chronic or acute diseases,¹⁶ they were chosen as the most favorable areas from which to obtain cultures. Cultures from teeth and tonsils were also used in certain instances. In most of the early experiments, separate cultures were made from the left and right nostrils but, as only minor differences were noted, subsequent cultures from both nostrils were combined.

Dextrose brain broth, made by adding approximately 3 gm. of calves' brains to about 10 c.c. of Bacto brain-heart infusion, was used for primary cultures. Each swab was placed in a tube of this medium and incubated for 18 to 24 hours. The swab was then discarded and a loopful of the culture was spread on two blood-agar plates by means of a glass spreader.¹⁷ Following Rosenow's suggestion, blood-agar cultures were grown anaerobically. Ordinarily there was a lighter growth on the second plate, which made it easier to find discrete colonies and to differen-

weighing between 1,400 and 1,600 gm.

In recording the occurrence of iritis, the designations two plus (++), three plus (+++) and four plus (++++) indicate the degree of iritis produced. Two plus (++) indicates definite congestion with marked engorgement of the vessels. Three plus (+++) indicates marked congestion of the iris, marked circumcorneal congestion, edema, and clouding of the iris with or without small hemorrhages. Four plus (++++) iritis indicates the same as three plus (+++) with the addition of exudate in the anterior chamber.

Chart 1

ACUTE IRITIS

Left Tonsil	{	2.0 c.c. Primary	++++	{	Colon Bacillus	{	2.0 c.c. ++++
		5.0 c.c. Primary	++++		α Strep. (5-5)	{	5.0 c.c. ++++
							2.0 c.c. No Effect
							2.0 c.c. No Effect
							5.0 c.c. No Effect
				↓			
				Eye	{	Colon Bacillus	
						Enterococcus	
Right Tonsil	{	2.0 c.c. Primary	++++	{	Colon Bacillus	{	2.0 c.c. ++
		5.0 c.c. Primary	++++		α Strep. (7-7)	{	5.0 c.c. ++++
							2.0 c.c. No Effect
							5.0 c.c. No Effect
				↓			
Both rabbits had hemorrhages in eyes and nose							

Illustrating the production of iritis in rabbits by the injection of both 2.0 c.c. and 5.0 c.c. of primary cultures from the tonsils of a patient with acute iritis. This is of interest because both series gave similar results; namely, the production of iritis by colon bacilli but not by streptococci.

tiate the various types. Since most of the cultures proved to be mixed growths, this was important. The primary cultures were then injected intravenously into rabbits. The organisms isolated from the blood-agar plates were purified, grown for 18 hours in brain-heart infusion and tested for toxicity* by the in-vitro methods of Chapman, Berens, and their associates.^{18, 19, 20, 21} The purified cultures were then injected intravenously into albino rabbits

Both 2.0 c.c. and 5.0 c.c. of the primary cultures from the first cases studied produced iritis in rabbits (chart 1). For the next few cases only 2.0 c.c. of the primary cultures was used. The results were negative, even though the patients from whom the cultures were obtained had pronounced ocular symptoms. An additional 2.0 c.c. or 3.0 c.c. of the same primary cultures was therefore injected into the same rabbits within 24 hours. Positive results were obtained in a number of instances (chart 2).

As a result of these findings, the initial dose was increased to 5.0 c.c. The increased dose produced satisfactory results with throat cultures but death occurred rapidly in the majority of rabbits injected with nasal cultures. Furth-

* The in-vitro toxicity tests referred to in this paper are listed in the following order: for staphylococci, hemolysis and coagulase tests¹⁸ and violet agar reaction;¹⁹ for streptococci, resistance to sodium bicarbonate and hexylresorcinol.²¹ In the staphylococcal reactions, toxicity is graded from negative to 4+. In the streptococcal tests, toxicity is graded from negative to 8+.

er study led to the belief that death was due to the colon bacilli and toxic staphylococci often recovered from the nasal membranes, and to the fact that these organisms grew more luxuriantly than streptococci, which usually predominate in the throat. It was then decided to use as an initial dose 5.0 c.c. for throat cultures and 3.0 c.c. for nasal cultures, although the optimum dose for each case varies and cannot be predetermined. In the case of nasal cultures, when an injection of 3.0 c.c. did not result in death or ocular disturbance within 12 to 24 hours, an additional 2.0 c.c. or 3.0 c.c. was usually given.

tures showed negative results and the rabbits survived 48 hours, no other rabbits were inoculated. Conjunctivitis was ignored except when it was marked. With one exception, whenever a primary culture produced iritis in rabbits, one or more of the purified strains also produced iritis in rabbits. Iritis was produced with pure cultures of streptococci, enterococci, nonlactose fermenters (degraded colon bacilli?), colon bacilli, and staphylococci.

Chart 3 illustrates a case of hemorrhagic retinitis in which the primary cultures did not reveal significant information, but in which four of the five

Chart 2

CHRONIC UVEITIS O.S.

Left Tonsil	}	{	2.0 c.c. Primary — No Effect	
		{	+ 2.0 c.c. Primary — + + + +	(Died 5 Days)
	↓			↓
	{		α Strep. 5-5	
	{		α Strep. 8-8	
	{		γ Strep. 5-5	
		← Compare →	Eye — γ Strep. 5-5	
Right Tonsil	}	{	2.0 c.c. Primary — No Effect	
		{	+ 2.0 c.c. Primary — + + +	

Illustrating an instance in which 2.0 c.c. of primary cultures from a patient with chronic uveitis failed to produce iritis in rabbits, whereas an additional 2.0 c.c. produced iritis.

The rabbits were observed at intervals commencing six hours after inoculation. Detailed examination was made after 12 to 15 hours and, if no ocular lesions were noted, again after 24 to 48 hours. The animals were then discarded. Recent observations show that iritis may appear as early as one to three hours after inoculation and subside within a few hours. In other instances, a definite iritis may not appear until the end of 10 to 12 hours. This indicates the necessity of early and more frequent observation.

When a primary culture produced a pathologic effect in the rabbit's eyes, all the purified brain-heart-infusion cultures of the isolated organisms were inoculated into rabbits to determine, if possible, which strain or strains produced the original eye lesion. This was also done when the rabbits died too early for the appearance of eye symptoms or when they died during the night. Ordinarily, if the primary cul-

tures showed negative results and the rabbits survived 48 hours, no other rabbits were inoculated. This demonstrates the value of testing individual strains.

Chart 4 illustrates the findings in a case of sclerokeratitis, possibly tuberculous, in which the primary cultures killed rabbits overnight but all the purified strains of streptococci produced iritis in rabbits.

Chart 5 illustrates the production of iritis in rabbits by the intravenous injection of a pure culture of enterococcus obtained from the left nostril of a patient with recurrent uveitis.

Chart 6 illustrates a case of recurrent iritis and episcleritis in which iritis was produced in rabbits by a nonlactose fermenter (possibly a degenerate strain of colon bacillus) isolated from the right nostril.

Chart 1 illustrates a case of acute iritis in which alpha streptococci and colon bacilli were isolated from the primary tonsil cultures. The colon bacilli

Chart 3

HEMORRHAGIC RETINITIS

Left Nostril	5.0 c.c. Primary — Died	α Strep. (5-5)	{	5.0 c.c. — No Effect
				5.0 c.c. — No Effect
Right Nostril	5.0 c.c. Primary — No Effect			
		γ Strep. (5-5)		5.0 c.c. + + + +
		α Strep. (3-3)		5.0 c.c. + + + +
Throat	5.0 c.c. Primary — Died	α Strep. (8-8)		5.0 c.c. + + + +
		α Strep. (8-8)	{	5.0 c.c. Died
				1.0 c.c. + + + +
		α Strep. (7-7)	{	5.0 c.c. Died
				1.0 c.c. No Effect
				+ 2.0 c.c. No Effect

Illustrating a case of hemorrhagic retinitis in which the primary cultures did not reveal significant information, but in which 4 of 5 strains of streptococci isolated from the throat culture produced iritis in rabbits.

Chart 4

SCLEROKERATITIS (T.B.?)

Left Nostril	5.0 c.c. Primary — Died Overnight			
Right Nostril	5.0 c.c. Primary — Died Overnight			
		β Strep.		5.0 c.c. + + +
		γ Strep. (0-0)		5.0 c.c. + + +
		α Strep. (7-7)		5.0 c.c. + + + +
Throat	4.0 c.c. Primary — Died Overnight	α Strep. (5-4)		5.0 c.c. + + + +
		α Strep.	{	5.0 c.c. + + +
				+ 3.0 c.c. + + +
		Staph. aur. (4-4-3)		1.0 c.c. Died Overnight

Illustrating the findings in a case of sclerokeratitis, possibly tuberculous, in which the primary cultures killed rabbits overnight but all the purified strains of streptococci produced iritis in rabbits.

Chart 5

RECURRENT UVEITIS

Left Nostril	{	2.0 c.c. Primary — No Effect	}	Enterococcus	5.0 c.c. + + + +
	{	+ 3.0 c.c. Primary — + + + +	}		
				Colon Bacilli	
				S. albus 0-0-0	
				α Strep. 5-5	{
				α Strep. 7-7	{
					↓
					Eye
Right Nostril	{	3.0 c.c. Primary — No Effect	}	Friedländer Bac.	{
	{	+ 2.5 c.c. Primary — + + + +	}		{
					5.0 c.c. Died
					2.5 c.c. Died
					1.0 c.c. Died
Throat	{	2.0 c.c. Primary — No Effect			
	{	+ 3.0 c.c. Primary — No Effect			

Illustrating the production of iritis in rabbits by the intravenous injection of a pure culture of enterococcus obtained from the left nostril of a patient with recurrent uveitis.

produced iritis in rabbits while the streptococci failed to produce iritis.

Chart 7 illustrates a case of suspected chronic tuberculosis of the choroid in which *Staphylococcus aureus* from the left and right nostrils produced iritis in rabbits with primary cultures but failed to do so after subculture.

In the earlier experimental work, staphylococci produced eye disease only

remainder were from patients with chronic diseases such as arthritis, thyrotoxicosis, and so on, but with no eye disease. The findings were similar to those in patients with inflammatory eye diseases, iritis being produced by cultures of streptococci, Friedländer bacilli, staphylococci and colon bacilli, although the frequency of positive results was not quite so high.

Chart 6

RECURRENT IRITIS, EPISCLERITIS

Left Nostril	5.0 c.c. Primary — Died	
Right Nostril	5.0 c.c. Primary — Died	Nonlact. fermenter 2.0 c.c. ++++
Throat	{ 5.0 c.c. Primary — No Effect + 2.0 c.c. Primary — No Effect	

Illustrating a case of recurrent iritis and episcleritis in which iritis was produced in rabbits by a nonlactose fermenter (possibly a degenerate strain of colon bacillus) isolated from the right nostril.

with the primary cultures, as shown in chart 7. Apparently the power to produce iritis was often lost before the subculture could be injected because, when it did not kill the rabbits, the eyes remained normal. Therefore, the inoculation of purified strains of staphylococci was discontinued temporarily. On resuming the testing of purified strains, iritis was produced in several instances

Chart 8 illustrates a control case (laboratory assistant) in which the primary throat culture and two of the five strains of streptococci isolated from it produced iritis in rabbits.

Chart 9 illustrates a control case (laboratory assistant) in which iritis was produced in rabbits by a strain of Friedländer bacillus isolated from the left nasal culture, by a strain of staphy-

Chart 7

OLD MILIARY TUBERCULOSIS OF CHOROID

Left Nostril	5.0 c.c. Primary ++++	Staph. aureus (2-3-3)	1.0 c.c. Negative
Right Nostril	5.0 c.c. Primary +++	Staph. aureus (2-3-3)	
Throat	5.0 c.c. Negative		

Illustrating the findings in a case of suspected chronic tuberculosis of the choroid, in which *Staphylococcus aureus* from the left and right nostrils produced iritis in rabbits with primary cultures but failed to produce iritis after subculture.

when only 1.0 c.c. of the culture was used.

Control experiments

Control cultures were obtained from apparently healthy persons having no obvious ocular infection. Five series of cultures were from laboratory assistants and three were from children. The

lococcus isolated from the right nasal culture, and by a strain of streptococcus isolated from the throat culture.

Chart 10 illustrates a control case (laboratory assistant) in which a strain of colon bacillus isolated from the primary right nasal culture produced iritis in a rabbit. This is an instance in which

Staphylococcus albus produced iritis in primary culture but not in subculture.

Chart 11 illustrates a control case (rheumatoid arthritis) in which all the primary cultures from the throat and from the left and right nostrils killed

mals in which eye lesions had been produced. Two cultures were overgrown by "spreaders," six yielded a number of different organisms, predominantly enterococci and colon bacilli, and only one yielded an organism similar to that in-

Chart 8

CONTROL CASE A.C.W.

Left Nostril	3.0 c.c. Primary — Died 1 Day	Staph. albus (4-3-4)	<div> 2.0 c.c. Died 12 hrs. 1.0 c.c. No Effect 0.5 c.c. No Effect </div>
Right Nostril	3.0 c.c. Primary — Died 1 Day		
Throat	5.0 c.c. Primary — + + + +	<div> α Strep. (7-7) α Strep. (8-8) α Strep. (0-0) α Strep. (4-4) α Strep. (6-6) </div>	<div> 5.0 c.c. + + + 5.0 c.c. No Effect 5.0 c.c. + + + + 5.0 c.c. No Effect 5.0 c.c. No Effect </div>

Illustrating the findings in a control case (laboratory assistant) in which the primary throat cultures and 2 of 5 strains of streptococci isolated from it produced iritis in rabbits.

rabbits overnight but in which none of the organisms isolated from these cultures produced iritis in rabbits.

Method of culturing eyes

In the early experiments, cultures of the eyes were made in nine of the ani-

jected intravenously. The method of obtaining the cultures may have been at fault. The eye was enucleated as soon as possible after death, placed in 50-percent alcohol for 15 minutes, and drained. It was then dropped into brain-heart infusion and cut. By the following

Chart 9

CONTROL CASE E.L.N.

Left Nostril	3.0 c.c. Primary — Died 12 hrs.	Friedländer Bac.	2.0 c.c. + + +
Right Nostril	3.0 c.c. Primary — + + +	<div> Staph. albus (3-4-3) α Strep. (5-5) α Strep. (8-8) </div>	<div> 3.0 c.c. + + 5.0 c.c. No Effect 5.0 c.c. No Effect </div>
Throat	5.0 c.c. Primary — Died 12 hrs.	<div> α Strep. (7-7) α Strep. (6-6) γ Strep. (0-0) α Strep. (4-4) α Enterococcus </div>	<div> 5.0 c.c. No Effect 5.0 c.c. No Effect 5.0 c.c. No Effect 5.0 c.c. + + + + 5.0 c.c. No Effect </div>

Illustrating the findings in a control case (laboratory assistant) in which iritis was produced in rabbits by a strain of Friedländer bacillus isolated from the left nasal culture, by a strain of staphylococcus isolated from the right nasal culture, and by a strain of streptococcus isolated from the throat culture.

method, which is now employed, no "spreaders" have appeared on the plates. The animal is anesthetized while the inflammation is at its height, the conjunctiva is irrigated with 1:200 Metaphen solution, a 27-gauge needle attached to a tuberculin syringe is

other rabbits. When organisms different from those injected intravenously were recovered from the aqueous they did not produce iritis in other rabbits. Eye cultures from six normal rabbits were negative.

Seventy percent of the iritis-produc-

Chart 10

CONTROL CASE A.E.D.

Left Nostril	3.0 c.c. Primary + + + +	Staph. albus (0-4-3)	2.0 c.c. Negative
Right Nostril	3.0 c.c. Primary — Died 12 hrs.	Colon Bacillus	2.0 c.c. + + + +
Throat	5.0 c.c. Primary — Negative		

Illustrating the findings in a control case (laboratory assistant) in which a strain of colon bacillus isolated from the right nasal culture produced iritis in a rabbit. This also illustrates the production of iritis by a primary nasal culture containing only *Staphylococcus albus* but the failure to produce iritis with the subculture.

plunged through the corneoscleral margin into the aqueous and all the fluid is aspirated. The possibility of contamination is thus reduced and, because the animal is still alive, the likelihood of obtaining live pathogenic organisms free from postmortem invaders is increased. Four eyes have been cultured by this latter method and two organ-

ing strains gave positive toxicity tests by the in-vitro methods, while 60 percent of the strains which did not produce iritis also gave positive in-vitro toxicity tests. Thus, the proportion of toxic strains (as judged by in-vitro tests) among those which produced iritis and those which did not produce iritis was similar (chart 12).

Chart 11

CONTROL—RHEUMATOID ARTHRITIS

Left Nostril	5.0 c.c. Primary — Died Overnight		
Right Nostril	5.0 c.c. Primary — Died Overnight		
Throat	5.0 c.c. Primary — Died Overnight	<div style="display: inline-block; vertical-align: middle;"> β Strep. (7-7) α Strep. (3-3) α Strep. (8-8) α Strep. (7-7) Nonl. ferm. </div>	<div style="display: inline-block; vertical-align: middle;"> 5.0 c.c. No Effect 5.0 c.c. No Effect 5.0 c.c. No Effect 5.0 c.c. No Effect 5.0 c.c. No Effect </div>

Illustrating the findings in a control case (rheumatoid arthritis) in which all the primary cultures from the throat and from both nostrils killed rabbits overnight, and none of the purified organisms from these cultures produced iritis in rabbits.

isms similar to those injected intravenously (*streptococcus* and *Staphylococcus aureus*) have been recovered. When an organism similar to that injected intravenously was recovered from the aqueous of the rabbit's eyes, the organism isolated from the eye produced iritis in

Discussion and comparison of our experimental results with those of other investigators

The subject of the production of iritis in rabbits by various microorganisms is complex. It is further complicated by the use of various methods by different

investigators. For example, Zanettin³ and Brown²² endeavored to enhance the iritis-producing power of organisms by growing them in association with uveal tissue but reached opposite conclusions. Maestro² tried to produce oculotropic properties in streptococci by passage through normal rabbits' eyes. Cusumano⁶ sought this effect by numerous passages of *Streptococcus viridans* and *Staphylococcus aureus* from eye to eye. He stressed the importance of using brain-broth medium. deAndrade⁸ tried to produce ocular sensitivity to tuberculous infection by trauma. Alagna and Tallo²³ attempted to demonstrate elective localization by culture of various organs after intravenous injection of bacteria. Finally, Brown²² endeavored to obtain a higher percentage of posi-

general virulence. In this connection, we noted that there was no correlation between the ability of toxic and nontoxic organisms (determined by in-vitro tests) to produce iritis. In many cases, an organism which was highly toxic according to these tests did not produce iritis, while in other cases a nontoxic strain produced violent iritis. Iritis was produced by alpha, beta, and gamma types of streptococci, although none of them were exotoxic. Rosenow and Nickel¹ stressed the importance of using freshly isolated strains because some strains rapidly lose their localizing power. Our observations substantiate this, especially for staphylococci.

The fact that many observers who have made contributions to the subject of the experimental production of in-

Chart 12

RELATION BETWEEN IRITIS-PRODUCING POWER AND TOXICITY OF STAPHYLOCOCCI AND STREPTOCOCCI

Strains which Produced Iritis (37)	{	Toxic	70%
		Intermediate	11%
		Nontoxic	19%
Strains which did not Produce Iritis (56)	{	Toxic	60%
		Intermediate	13%
		Nontoxic	27%

Comparison of toxicity (as determined by in-vitro tests) of strains of streptococci and staphylococci which produced iritis in rabbits with the toxicity of those strains which failed to produce iritis.

tive results by injection of the cultures into the carotid artery.

Various specific microorganisms, such as *Treponema pallidum*²⁴ and *Mycobacterium tuberculosis*²⁵ are believed to have been isolated from the eye in disease.

Investigators have produced iritis in rabbits by injection of streptococci,^{1, 12, 13, 14, 22} *Staphylococcus aureus*,^{3, 6, 22} *Bacillus subtilis*,²² and pneumococci.¹ We obtained positive results with *Staphylococcus aureus*, *Staphylococcus albus*, streptococci (alpha, beta, and gamma types), enterococci, colon bacilli degenerate colon bacilli, and Friedländer bacilli with about equal frequency.

Rosenow and Nickel¹ stated that the usual tests for virulence, although useful for the determination of pathogenicity of streptococci, do not suffice to measure peculiar or specific effects, especially of those strains having a low

fectious eye lesions drew widely different conclusions, suggests that there is much to be learned. Because the methods used have not been uniform, it is impossible to compare the results satisfactorily.

Summary and conclusions

Iritis was produced in rabbits by the intravenous injection of either primary or purified cultures from 19 of 21 patients with acute or chronic eye diseases, and in 11 of 14 controls (laboratory assistants, healthy children and patients with arthritis and thyrotoxicosis).

Positive results were obtained with various microorganisms as follows: streptococci (alpha, beta, and gamma types), staphylococci (albus and aureus), colon bacilli, nonlactose fermenters, enterococci, and Friedländer bacil-

li. Of the 51 primary cultures from patients with eye disease, 25.5 percent produced iritis in rabbits and 39 percent caused death of the rabbits before examination or too early for the production of eye symptoms. Of the 35 primary cultures from the control group, 26 percent produced iritis and 60 percent caused death of the rabbits before iritis was observed. The high mortality of the rabbits injected with primary nasal cultures accounts for the large number of undetermined results.

Iritis was produced by 44 percent of

Of the total of 134 cultures from patients with eye disease, 36 percent produced iritis while 17.9 percent were undetermined. Of the total of 116 cultures from persons in the control group, 29.2 percent produced iritis in rabbits, while 21.5 percent were undetermined.

Toxicity, as measured by in-vitro tests, did not seem to be related to the iritis-producing power of streptococci and staphylococci. Seventy percent of the organisms which produced iritis gave positive toxicity reactions, whereas 60 percent of the strains which did

Chart 13

SUMMARY OF RESULTS IN THE PRODUCTION OF IRITIS BY THE INTRAVENOUS INJECTION OF PRIMARY CULTURES AND PURE CULTURES ISOLATED FROM THEM.

Type of Culture	Patients with Eye Lesions (21)			Control Cases (14)		
	Number Tested	Percent Positive	Percent Undetermined*	Number Tested	Percent Positive	Percent Undetermined*
Primary (mixed)	51	25.5	39	35	26	60
Streptococci	61	44	0	69	29	3
Staphylococci	6	17	50	8	37.5	12.5
Colon bacilli	4	75	25	1	100	0
Nonlact. fermenter	3	67	0	1	0	100
Enterococci	7	28.5	0	0	0	0
G. tetragena	1	0	0	0	0	0
Pneumococci	1	0	0	1	0	100
Friedländer bacilli	0			1	100	0
Total	134	36	17.9	116	29.2	21.5

The cultures were obtained from the nose, throat, and other foci of patients with inflammatory eye disease and from controls (laboratory assistants, healthy children, and patients with arthritis and thyrotoxicosis but without obvious eye symptoms).

* Died without examination.

61 purified strains of streptococci from patients with eye disease as compared with 29 percent of 69 strains from persons in the control group.

Of the other organisms from patients with eye disease, 36 percent of the 22 purified strains of staphylococci, members of the colon group, and enterococci produced iritis. The results were undetermined in 18 percent. In the control group, 41 percent of the strains of staphylococci, members of the colon group, and Friedländer bacilli produced iritis. The results were undetermined in 25 percent.

not produce iritis also gave positive toxicity reactions.

It is concluded that, while iritis is produced in rabbit's eyes by various cultures of bacteria, this property is not characteristic of any one bacterial genus, neither is it distinctly a property of cultures from patients with inflammatory eye diseases.

We wish to express our sincere appreciation to Dr. James M. Evans and Miss Adele Mayo for their coöperation in this study.

35 East Seventieth Street.

References

- ¹ Rosenow, E. C., and Nickel, A. C. Elective localization in determining etiology of chronic uveitis. *Amer. Jour. Ophth.*, 1932, v. 15, p. 1.
- ² Maestro, T. Oculotropismo sperimentale degli streptococchi. *Boll. d'ocul.*, 1935, v. 14, p. 1251.
- ³ Zanettin, G. Localizzazione elettiva dello stafilococco nell'occhio (Contributo sperimentale alla questione delle infezioni focali). *Ann. di ottal. e clin. ocul.*, 1933, v. 61, p. 20.
- ⁴ ———. Infezioni focali e malattie oculari. *Ann. di ottal. e clin. ocul.*, 1934, v. 62, pp. 588, 695, and 786.
- ⁵ Blanc, G., and Martin, L. A. Iridocyclite expérimentale provoquée par virus typhique. *Compt. rend. Acad. d. sc.*, 1935, v. 200, p. 865.
- ⁶ Cusumano, A. Infezione focale e localizzazione secondaria nell'occhio (Contributo sperimentale sul tropismo elettivo batterico). *Rassegna Ital. d'Ottal.*, 1935, v. 4, p. 46.
- ⁷ Wherry, W. B., and King, C. Case illustrating local sensitization of eye to bacterial protein. *Jour. Med.*, 1927, v. 8, p. 85.
- ⁸ de Andrade, L. Experiments on the influence of injuries of the eye on localization of focal phenomena from tubercle bacilli introduced into the blood stream, and remarks on the question of sympathetic ophthalmia. *Klin. M. f. Augenh.*, 1934, v. 92, p. 350.
- ⁹ von Herrenschwand, F. Spirochaeten und Bacillus fusiformis bei akuter Konjunktivitis. *Zeit. f. Augenh.*, 1927, v. 62, p. 370.
- ¹⁰ Brown, A. L. Considerations underlying experimental production of uveitis. *Amer. Jour. Ophth.*, 1932, v. 15, p. 19.
- ¹¹ ———. Chronic uveitis. Bacteriologic and immunologic considerations. *Arch of Ophth.*, 1934, v. 12, p. 730.
- ¹² Irons, E. E., Brown, E. V. L., and Nadler, W. H. The localization of streptococci in the eye. A study of experimental iridocyclitis in rabbits. *Jour. Infect. Dis.*, 1916, v. 18, p. 315.
- ¹³ Meisser, J. G., and Gardner, B. S. Elective localization of bacteria isolated from infected teeth. *Jour. Amer. Dent. Assoc.*, 1922, v. 9, p. 578.
- ¹⁴ Haden, R. L. Elective localization in eye of bacteria from infected teeth. *Arch. Int. Med.*, 1923, v. 32, p. 828.
- ¹⁵ Billings, F. Focal infection. New York, Appleton-Century Co., 1916.
- ¹⁶ Berens, C., Connolly, P. T., and Chapman, G. H. Focal infection in diseases of the eye. 1. Report of certain laboratory examinations. *Brit. Jour. Ophth.*, 1934, v. 18, p. 463.
- ¹⁷ Rawls, W. B., and Chapman, G. H. Experimental arthritis in rabbits. Comparison of the arthritis-producing ability of inagglutinable streptococci which resist the "bactericidal" action of fresh, diluted, defibrinated guinea pig blood and those which are agglutinable but sensitive to the "bactericidal" agent. *Jour. Lab. and Clin. Med.*, 1935, v. 21, p. 49.
- ¹⁸ Chapman, G. H., Berens, C., Peters, A., and Curcio, L. Coagulase and hemolysin tests as measures of the pathogenicity of staphylococci. *Jour. Bact.*, 1934, v. 28, p. 343.
- ¹⁹ Chapman, G. H., and Berens, C. Crystal violet agar as a differential medium for staphylococci. *Jour. Bact.*, 1935, v. 29, p. 437.
- ²⁰ Chapman, G. H., and Rawls, W. B. Studies of streptococci I. Qualitative differences in resistance to various agents. *Jour. Bact.*, 1936, v. 31, p. 323.
- ²¹ Chapman, G. H., and Curcio, L. Studies of streptococci II. Quantitative differences in resistance to sodium bicarbonate and hexylresorcinol. *Jour. Bact.*, 1936, v. 31, p. 333.
- ²² Brown, A. L. Chronic uveitis. Bacteriologic and immunologic considerations. *Trans. Sec. Ophth. Amer. Med. Assoc.*, 1934, p. 111.
- ²³ Alagna, G., and Tallo, F. Sulla diagnosi dei foci tonsillari e sul tropismo elettivo dei batteri in essi contenuti; Contributo clinico-sperimentale. *Arch. Ital. di Otol. Rinol. e Laringol.*, 1935, v. 47, p. 112.
- ²⁴ Collins, E. T., and Mayou, M. S. Pathology and bacteriology of the eye. Ed. 2, Philadelphia, P. Blakiston's Son and Co., 1925, p. 557.
- ²⁵ Meller, J. Nachweis von Tuberkelbazillen bei Uveitis durch Kultur aus dem Gewebe des Augeninnern. *Zeit. f. Augenh.*, 1932, v. 77, p. 1.

TOBACCO AMBLYOPIA; ALCOHOL AMBLYOPIA

Report of One Uncomplicated Case of Each Condition

FRANK D. CARROLL, M.D. AND C. RAY FRANKLIN, M.D.

NEW YORK

The syndrome often spoken of as "tobacco-alcohol amblyopia" in the United States is called "tobacco amblyopia" in Great Britain and "alcohol amblyopia" in France. The authors report one case of alcohol amblyopia in a person who never used tobacco and one case of tobacco amblyopia in a teetotaler. They feel that the amblyopia may be associated with the use of either substance. From the Eye Institute of the Columbia-Presbyterian Medical Center.

There has been a considerable difference of opinion regarding the relative importance of alcohol versus tobacco in that clinical entity often called tobacco-alcohol amblyopia. English writers refer to this condition as "tobacco amblyopia"; French oculists call it "alcohol amblyopia." Almost always, at least in this country, the disease apparently occurs in patients who use both alcohol and tobacco. Therefore, we thought it might be of interest to report one case of alcohol amblyopia in a patient who had never used tobacco in any form and one case of tobacco amblyopia in a patient who was a teetotaler.

At "a special meeting for the collection of facts as to toxic amblyopia" held by the Ophthalmological Society of the United Kingdom¹ in 1886 it was decided that this entity was due to tobacco. No case caused by alcohol was found. Report of tobacco amblyopia in teetotalers was made by Nettleship,¹ Morton,¹ Griffith,¹ Berry,¹ and Shears.¹ Connor² described two cases in patients who were total abstainers from alcohol in any form and reviewed 27 similar cases in the literature. Powers³ reported a case of tobacco amblyopia in a 19-year-old boy who was a teetotaler. Creveling⁴ reported a similar case in a 23-year-old youth. Usher and Elderton⁵ in a study of 1,100 cases stated that 112 of the patients were total abstainers from alcohol. Certainly there seem to be on record numerous authentic cases of tobacco amblyopia in patients who have consumed no alcohol. Traquair⁶ says that the term tobacco-alcohol amblyopia is incorrect in so far as Great Britain is concerned and that any influence that alcohol may have is merely

that of a factor in depressing the general health.

On the other hand, the French oculist Bussy⁷ claimed that tobacco plays no role in this condition, that the term nicotine-alcohol amblyopia should be abandoned, that it should be called alcohol amblyopia. Daguenet⁸ and Rollet,⁹ other French authors, also write only about "alcohol" amblyopia.

Report of Cases

Case 1. A 28-year-old negro girl was seen at the Vanderbilt Eye Clinic where she complained of poor vision which had been present for several months. She said she saw better in dull light than in bright light. A strong alcoholic odor surrounded her; detailed questioning finally revealed that she was a heavy drinker but had never smoked a cigarette. She lived in Harlem and daily started drinking in the afternoon at one of the bars or night clubs there and would continue to go from one such place to another until the following morning. This had been her daily routine for over one year.

Eye examination: Vision in each eye was 20/200, unimproved, the discs had a moderate temporal pallor, and the fields showed a centrocaecal scotoma (Fig 1); otherwise the examination revealed nothing abnormal. The neurological examination was negative except for a marked tremor of the tongue and fingers. The blood Wassermann was negative. Gastric analysis showed a complete absence of free or combined hydrochloric acid and the medical consultant made a diagnosis of alcoholic gastritis. The patient had a mild macrocytic type of anemia with a red blood

count of 3,400,000 and a hemoglobin of 80 percent. X-ray films of the skull, sinuses, optic canals, and teeth were negative.

The patient had apparently been on a poorly balanced diet but had not lost weight. Since it has been estimated¹⁰ that about 1,600 calories per day may be obtained from alcohol, it is easy to understand why the caloric intake of most chronic alcoholics is adequate although the diet may be very inadequate

(C.R.F.) on January 2, 1936. He said that his vision had been gradually failing for eight months and that one month previously he began using a magnifying glass in order to read. He had smoked 12-15 cigars daily for several years but maintained that he never had taken alcohol in any form. At every subsequent visit he was encouraged to give a history of even slight alcoholic intake but he strongly denied this. The fact that he was a teetotaler was a

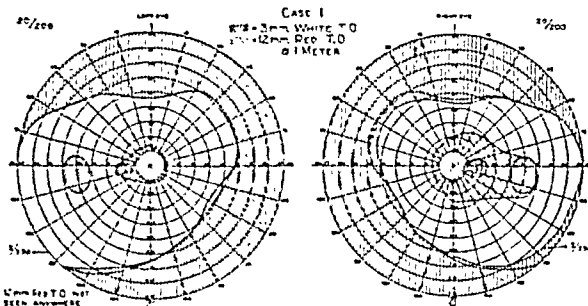


Fig. 1

Fig. 1 (Carroll and Franklin). Visual-field chart in case 1 (alcohol amblyopia).

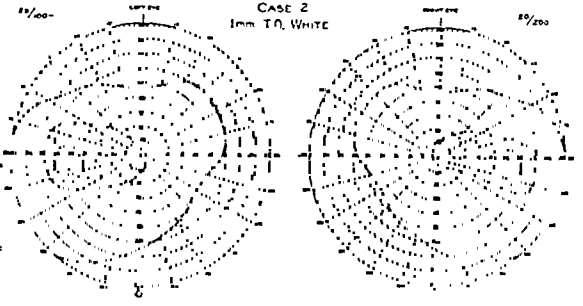


Fig. 3

Fig. 3 (Carroll and Franklin). Visual-field chart in case 2 (tobacco amblyopia).

in other respects. This patient probably consumed between one pint and one quart of whiskey daily. On every visit to the clinic she has vigorously denied having ever used tobacco in any form, and since no stigma is associated with cigarette smoking by women there seems no reason to question her veracity about this. It is most unlikely that a woman who would admit that she was a heavy drinker would deny that she occasionally smoked a cigarette if the latter were true.

For 20 months the patient has been seen at frequent intervals. Although advised to discontinue drinking she always, when seen in the Clinic, has a breath with an alcoholic odor. The vision improved to 20/70 in three months and has remained stationary since then. The discs now show very marked temporal pallor (fig. 2) consistent with, but not diagnostic of, partial atrophy of the papillomacular bundles. Progressive improvement in vision accompanied by an increase in the pallor of the discs is not uncommon in these cases.

Case 2. A ship captain, aged 59 years, was seen privately by one of us

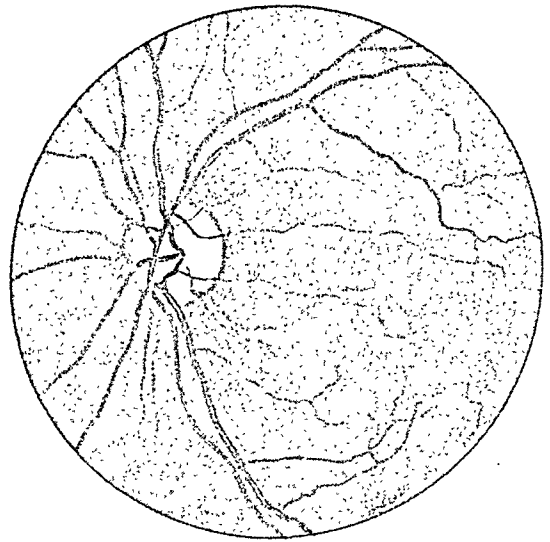


Fig. 2 (Carroll and Franklin). Fundus drawing in case 1 showing pallor of disc.

source of considerable pride to him. Eye examination revealed vision O.D. 20/200, O.S. 20/100—1, with glasses unimproved. In both eyes there were slight peripheral lens changes, moderate sclerosis of the retinal vessels, normal discs, and a centrocaecal scotoma as shown in figure 3. The vision gradually improved and in 2.5 months, just

before he moved from New York, his vision was O.D. 20/40, O.S. 20/40— with correction. The scotomas had greatly decreased in size.

was a case of tobacco amblyopia in a patient who was a total abstainer from alcohol in any form. The other was a case of alcohol amblyopia in a patient who had never used tobacco.

Summary

Two cases are reported in patients who had similar types of scotomas. One

635 West One Hundred
Sixty-fifth Street.

References

- ¹Trans. Ophth. Soc. U. Kingdom, 1887, v. 7, p. 36.
- ²Connor, L. Jour. Amer. Med. Assoc., 1890, v. 14, p. 217.
- ³Powers, G. H. Med. News, Dec. 4, 1886.
- ⁴Creveling, E. L. California Western Med., 1930, v. 32, p. 110.
- ⁵Usher, C. H., and Elderton, E. M. Ann. of Eugenics, 1927, v. 2, pts. 3 and 4, p. 245.
- ⁶Traquair, H. M. Edinburgh Med. Jour., 1935, v. 42, pt. 2, p. 153.
- ⁷Bussy, L. Le Jour. de Med. de Lyon, 1926, v. 7, p. 161.
- ⁸Daguenet. Ann. d'Ocul., 1869, v. 62, p. 136.
- ⁹Rollet. Le Jour. de Med. de Lyon, 1921, v. 29, p. 809.
- ¹⁰Jolliffe, N., Colbert, C. N., Joffe, P. M. Amer. Jour. Med. Sci., 1936, v. 191, p. 515.

RESULTS OF THE SURGERY OF GLAUCOMA

LOUIS BOTHMAN, M.D.

CHICAGO

AND

MARVIN J. BLAESS, M.D.

MARSHALLTOWN, IOWA

A preoperative study of symptoms and the operative results judged by the vision, fields, and tension on 143 eyes are presented. Ninety-five eyes had vision of 0.1 or more before operation and 48 had less than that amount of vision. An analysis of those cases in which the fields were constricted to within a few degrees of the fixation point is made, and the results show that such a constriction should be no contraindication to surgical intervention. The findings corroborate the results of Eerola, whose survey of the literature showed that late infections from all sources were only 1.8 percent and that the fear of this condition is exaggerated. From the Division of Ophthalmology, University of Chicago, Dr. E. V. L. Brown, Director. Read before the Chicago Ophthalmological Society, March 16, 1936.

This presentation is an analysis of 100 cases (143 eyes) of primary glaucoma including seven cases in which there were retinal hemorrhages before operation and eight patients (13 eyes) with hydrophthalmos. No case with evidence of iridocyclitis is included. All but six eyes were operated on in private hospitals, either by Dr. E. V. L. Brown or by me, or at Billings Hospital by various members of the Senior staff and residents during the past eight years. Four eyes were operated on by Professor Holth in Oslo. These had been thoroughly studied before the patients went abroad and were followed for 10 to 20 years afterward. One patient (both eyes) was operated on by Drs. Parker and Slocum in Detroit.

Observations on the eyes in this series varied from 1 month to 20 years.

For 3 months or less there were	24 eyes
6 months or less there were	7 eyes
9 months or less there were	11 eyes
12 months there were	20 eyes
18 months there were	13 eyes
2 years there were	22 eyes
3 years there were	8 eyes
4 years there were	13 eyes
5 years there were	16 eyes
9 years there were	2 eyes
10 years there were	2 eyes
14 years there were	2 eyes
20 years there were	2 eyes

A family history of glaucoma was obtained in three cases. One patient's mother and sister had the disease; another had one brother and the third had one sister blind from glaucoma.

The ages ranged from 26 to 80 years,

the average being 59.2. There were 45 males aged from 26 to 74 with an average of 58.3 years, and 55 females from 26 to 80, with an average of 59.9 years.

There were 120 hyperopic eyes and 16 patients (23 eyes) were myopic. Among these patients were four eyes highly myopic (over 10 diopters).

Fifteen patients had heart disease, which varied from myocarditis and auricular fibrillation to angina pectoris.

There were four diabetic patients and 16 with nephritis, three with marked arterial hypertension. Two patients had positive Wassermann reactions. One had pernicious anemia. One patient had a cerebral sclerosis, one a goiter with B.M.R. +39 percent and another had had a thyroidectomy seven years before. One was allergic to potatoes. One had an endocrine disturbance, one was obese, and two had had hysterectomies. In seven eyes, there were retinal hemorrhages when first examined.

The vision recorded before operation was the best obtained while the eye was under the lowest tension possible with miotics and was often much better than the initial vision during an acute attack.

The fields were the largest obtained with the eye under a miotic and not those obtained during the acute stage.

Symptoms in order of frequency were blurring 50 times; pain 45; halos 40; redness 35; headache 33; nausea 14; and emesis 3.

In this series, there were 54 cases in which the Schiötz tonometer reading was higher than 50 mm. Hg, and in 50 of these, there were steamy corneae. In four the reading was higher than 50 mm. without this finding, and in four with less than 50 mm. of tension the corneae were steamy. All of this last group had tensions higher than 39 mm. Hg. All 54 eyes with a Schiötz reading of over 50 mm. had shallow anterior chambers. There were 14 additional eyes with shallow chambers, whose tension was less than 50 mm. Of these, three were under 30 mm. of pressure. No eyes with a Schiötz reading of 50 mm. or more had normal anterior chambers.

G. Salvati¹ called attention to the fact

that the "middle pressure," that is, half the pulse pressure (mean of the difference between systolic and diastolic blood pressure), closely approximated the intraocular pressure in glaucoma. A survey of the material at hand revealed that of the 95 patients for whom the figures were available, 20 had a mean pulse pressure within 5 mm. of the Schiötz reading in eyes untreated with miotics and 26 were within this same range after the use of miotics. In 46 of the 95 cases, the pulse pressure was within 5 mm. of the intraocular pressure. In these same 95 cases, the average pulse pressure was 34 mm. The average of the Schiötz reading before miotics was 53 mm. and the average after miotics was 34 mm. In individual cases, the figures check more consistently for those with less than 50 mm. of intraocular pressure and patients without arterial hypertension.

The following operations were performed on the eyes in this series: Elliot trephining (three with complete iridectomy), 100; iridectomy, 13; Holth sclerectomy (one with complete iridectomy, 11; Lagrange sclerectomy, 12; cyclodialysis, 4; iridencleisis, 1; iridotaxis, 1; vitreous fistula, 1; and enucleations, 9. Of this last group, four were seeing eyes before the first glaucoma operation.

The following table indicates the condition of the remaining eye in patients who underwent enucleations:

1 glc. with vision of 0.6 in remaining eye
18 months later
1 glc. with vision of 1.5 in remaining eye
14 years later
1 glc. with vision of 0.8 in remaining eye
2½ years later
1 glc. with vision of 0.8—3 in remaining eye
9 years later (iridectomy)
1 glc. with vision of 0.4 in remaining eye
9 years later (iridectomy)
1 glc. with vision of 1.2 in remaining eye
18 months later
3 glc. blind before operation

Complications of the surgical procedure in these cases were as follows:

Hemorrhage into anterior chamber at operation, 21; after operation, 19.

Buttonhole of the conjunctiva, 7; of these 2 developed iritis.

Prolapsed iris, 2.

Choroidal detachment, 20; 1 was operated on to replace the choroid and 1 other remained in a blind eye.

Iritis, 8.

Lenses injured at operation, 2.

Expulsive hemorrhage, 2 cases (table 1, no. 68; table 2, no. 38).

Detachment of Descemet's membrane, 1.

Vitreous prolapsed at operation 5 times.

Of these, 3 eyes were enucleated for pain and inflammation (cases table 2, no. 8, 13, and 48).

Vitreous hemorrhage occurred after operation in 1 case. There were no late infections.

Aino Eerola² in a survey of the literature found only 100 late infections (1.8 percent in 5616 Elliot trephining operations and four cases, or 4 percent, in 954 iridencleisis operations. In Holth's clinic only one, or 0.3 percent occurred in 305 trephine operations and 0.7 percent in 137 iridencleisis operations. We have never seen an eye lost from a late infection following a fistulating operation for glaucoma. S. Kotljarewskaja³ had no late infections. A. Del Barris⁴ had as high as 5.5 percent of late infections in his cases.

Results in patients with better than 0.1 vision (table 1) before operation, as judged by the vision, fields, and tension, were as follows:

Of the 70 patients who underwent Elliot trephining operations, 48 showed no change or improvement of fields or vision and had normal tension.

Seven had poorer vision, but the fields and Schiötz readings were normal and unchanged. Of these, one had a postoperative iritis.

Ten patients had poorer vision, smaller fields but a normal tension. Of these one had diabetes and syphilis; one had 15 diopters of myopia; one had diabetes and nephritis; three had choroidal detachments. In one case the flap was buttonholed and iritis and cataract developed. Two had lenses injured at operation and one had a cataract operation with 12/10 vision but developed optic atrophy two years later.

Five patients had poorer fields and vision and the tension remained high. Of these one had myopia of 15 diopters; one had 0.3 vision for two years and then a cataract developed. One had nephritis and hypertension. One had a Lagrange operation in nine months, then iritis and shrinking of the globe. One had 0.6 vision for five years, then developed a cataract.

Following the one iridencleisis operation, the vision, fields, and tension improved.

In the case in which cyclodialysis was performed, the vision was poorer, but the fields and tension were normal while miotics were used. In three patients operated on by the Lagrange method, the vision, fields, and tension were better or unchanged.

Simple iridectomy was performed in six cases in which the vision, fields, and tension were better or unchanged. In two others, there was improvement in one for five months, then blindness from a cataract; in the other further surgery was required with resulting vision of 3/200.

In the eight cases in which there were Holth operations, the vision and fields were improved or unchanged and the tension remained normal. Of the patients in table 1, 13 required miotics to maintain normal tension while 70 did not (three eyes in this group were enucleated).

Field changes

Arcuate scotomata were found in 10 cases. One remained after operation and nine disappeared after surgical intervention. In one case, an arcuate scotoma first appeared after operation.

Reduction of the fields to within 8 degrees of the fixation point was found in 48 cases. There were six cases in which there was reduction to 8 degrees from the point of fixation. None of these showed any further loss following operation. In fifteen cases fields were reduced to 5 degrees from the fixation point. In four of these there was some loss in the central field. One patient with a reduction to within 3 degrees had a visual loss from 0.1 to perception of light. She had 15 diopters of myopia and the operation was complicated by a vitreous prolapse. A second patient with a like restriction to within three degrees of fixation lost vision from 0.2—1 to finger counting at 8 inches. This patient had 14 diopters of myopia. A third such patient (reduction to within 3 degrees of fixation) had a visual loss from 0.3 to perception of light in two years. The vision was 0.3 for two years. A cataract was removed,

a choroidal detachment occurred, and the final vision as recorded was obtained four months after the cataract extraction. The fourth patient with loss of field had vision of 0.2—1 reduced to 3/200 after a cataract extraction and choroidal detachment.

There were 10 patients whose fields were within 2 degrees of fixation. One had a further constriction of the fields. The vision was reduced from 0.4 to perception of light. The flap was button-holed; iritis and cataract followed.

Of the 17 patients whose fields were within 1 degree of the fixation point, only two showed further loss. In one, vision dropped from 0.2 to perception of light. The lens was injured at operation. Choroidal detachment was present and a completely opaque lens was found three weeks later. In the other case, a patient with diabetes and syphilis, the vision dropped from 0.2—1 to 8/200.

Only seven of the 48 patients with central fields constricted to within 8 degrees of fixation had any further loss of fields or reduction of vision. All of these were desperate cases in which vision was poor and in four there were operative complications.

J. Etienne⁵ states that constricted fields are no contraindication to operation. Our findings bear this out.

Our series is too small to permit the drawing of any conclusions as to the value of the various operative procedures for glaucoma except in the case of the Elliot trephining operation. In this instance, summarizing the cases (table 1) in which there were useful eyes before operation we find:

70 eyes were operated on by this method. 48, or 68.5 percent, had as good or better fields and vision with normal tension following operation.

7, or 10 percent, had poorer vision with normal fields and tension after operation.

10, or 14.2 percent, had poorer vision and fields with normal tension after surgery.

5, or 7.1 percent had poorer vision, fields, and high tension.

65, or 98.2 percent, had normal tension.

Comparing these findings with N. Philippow's⁶ series of 54 cases after cyclodialysis, we find that he had 98.1 percent with normal and 1.9 percent with higher-than-normal tension. Vis-

ion improved in 88.4 percent and was unchanged in 15.4 percent. He found that the late results in his cases were poorer than after Elliot trephining operations.

S. Kotljarewskaja³ performed 74 Elliot trephining after which the tension was normal in 97 percent, and 84 percent of patients had improved vision in compensated cases. Of 31 cases followed one to four years, the vision was improved in 82 percent and unchanged in 18 percent. He had no late infections.

Joseph Etienne analyzed 43 cases of acute glaucoma with iridectomy and 144 cases of chronic glaucoma (89 trephining operations, 29 Lagrange, 7 Holth, 12 iridectomy, and 6 cyclodialysis). In 114 the tension remained normal (7 with second operation) and 25 patients continued to have hypertension. Five eyes in his series were enucleated.

A. Knapp⁷ presented his results in 200 chronic-glaucoma cases, in 80 of which he had performed Elliot trephining and in 95, Lagrange sclerectomies. Sixty of the 80 trephining were successful with one operation and nine more with a second operation. Eighty-five Lagrange operations were successful with one operation and two more after a trephination. In 12 cases iridectomy was performed with good results in seven, and after trephination in an eighth case. The Lagrange operation was performed on selected patients with good fields.

There were 20 patients operated on for glaucoma while they still had useful vision in the eye undergoing operation, whose mate was not operated upon. Of these 15 had useful vision in the eye not operated upon. The poorest vision among these was 0.2 (39 months after operation). The remaining 14 patients had vision of from 0.4 to 1.5 for periods from 2 to 14 years. One had a tension of 30 mm. with vision of 1.0 and another 41 mm. with vision of 1.5. All other eyes had normal tension.

These findings make us sometimes hesitate before advising, certainly before urging, an operation on a compensated glaucomatous eye.

J. Etienne followed 34 eyes from two

Table 1

INITIAL VISION OF MORE THAN 0.1

No.	Sex	Age	B.P.	Hyperopic	Previous Oper.	Eye	Operation	D.V.	Pupil	Sch. High	Sch. Low	Degree of Fixation	Glc. in mate	Per. Field			
														UN	UT	LN	LT
1	M	56	92/60	+	0	L	T	0.8	2.25	48.5	26.5	8	+	30	20	0	0
2	M	54	126/104	+	0	L	L	1.0	3.25	40	15.5		0	20	50	50	50
3	M	48	86/60	+	0	L	T	0.8-1	5.5	39	27.5	3	+	35	50	40	55
4	F	26	110/80	0	0	R	T	0.1	6.5	50	45	3	+	5	8	8	4
5	M	53	140/70	+	0	L	T	0.3-1	5.5	58	56	-	+	10	10	10	10
6	F	57	180/86	+	0	L	T	0.4-2	5	63	21.5	-	0	35	55	36	50
7	M	56	114/72	+	0	L	T	0.8	3.5	37.5	20	-	+	25	70	17	55
8	F	62	146/70	+	0	R	Ir	0.1	6	77	19	8	+	35	30	40	60
9	F	69	190/98	+	0	L	T	0.8-2	3	66	21.5	-	+	20	20	50	25
10	F	65	120/70	+	0	L	T	1.5-4	5	56	41.5	8	+	35	55	50	60
11	F	27	132/80	+	0	L	C	1.5-2	2.5	63	115	-	+	Complete			
12	F	65	140/84	+	0	R	T	0.5+2	6	59	20	5	+	5	35	10	35
13	F	58	188/112	+	0	R	T	0.8-3	4	60	17.5	-	+	45	60	45	75
14	F	58	188/112	+	0	L	T	1.2-4	4	35	15	-	+	45	75	40	78
15	F	75	176/90	+	0	L	T	0.8	4	39	25	+	+	0	40	0	40
16	F	38	110/76	+	0	L	T	0.4	1.5	40	22	-	+	35	50	40	75
17	F	72	108/66	+	0	R	T	0.5+2	1.75	48	22	3	+	30	55	48	70
18	F	74	166/96	?	0	L	T	0.8-3	3	56	31	1	+	35	65	50	75
19	M	65	?	+	0	R	T	0.8+3	3.25	42	17	2	+				
20	M	30	140/70	0	0	L	T	0.2-1	4	48	23	3	+				
21	F	79	184/80	+	0	L	T	0.1	5×6	39	23	5	+	30	40	5	10
22	M	50	152/104	+	0	R	T	1.0	2	26.5	18.5	-	+	30	75	45	75
23	M	65	158/90	+	0	L	T	1.0	1.75	36	22	2	+	5	50	40	70
24	M	41	130/78	0	0	R	T	0.5-1	3.25	45	17	1	+	35	50	50	80
25	M	60	135/61	0	0	L	T	0.2	2.5	45	29	4	+	25	60	15	80
26	F	71	160/80	0	0	R	T	0.6+3	6.5	45	26.6	1	+	5	30	50	28
27	M	50	138/85	0	+	R	T	0.2	2	45	35	1	+	8	8	5	6
28	M	50	135/80	+	0	R	T	0.2+1	5.5	56	21.5	1/2	+	40	55	30	70
29	M	67	?	+	0	R	T	0.3	7	56	52	-	+	15	55	15	85
30	M	66	162/100	+	0	L	T	0.4-1	4	69	25	1	+	5	52	30	30
31	M	69	126/70	+	0	L	T	0.3+1	3	41.5	23	-	+	50	60	40	80
32	F	70	180/90	+	0	L	T Ir	0.8	3.5	31	23	-	0	50	45	40	70
33	F	70	170/90	+	0	R	T	0.5-2	5	42	35	5	+				
34	F	62	200/100	+	0	R	T	0.8-3	4	61	56	5	+	25	42	35	62
35	F	76	158/70	+	0	R	T	0.2	1.5	41	31.5	1	+	1	15	40	60
36	F	76	158/70	+	0	L	T	0.1	1.5	56	35.5	3	+	3	15	15	18
37	F	59	?	+	0	R	T	0.5+2	4.5	54	36	2	+	15	18	10	10
38	M	42	130/80	0	0	R	T	0.3+1	3	41	35	-	0				
39	M	62	?	?	0	L	T	1.0-2	2	61	48.5	-	0	20	22	10	12
40	F	77	106/58	+	0	R	T	0.1	4	42	30	1	+	5	8	35	10
41	M	64	115/70	+	0	R	L	0.5-2	-	50	20	1	+				
42	M	39	?	+	0	R	T	1.5-4	4	48	30.5	-	+	45	50	40	70
43	M	39	?	+	0	L	T	0.6+3	4	52	20	5	+	5	50	5	75
44	F	67	180/98	+	0	R	T	1.5-3	3	31	17.5	-	+	50	60	50	75
45	F	64	-	+	0	R	T	1.2+3	3	48.5	35.5	4	+	20	70	50	80
46	F	47	-	+	0	L	T	F. at 4'	4.5	72	60	-	+	45	70	45	80
47	F	61	200/120	+	0	R	H	1.0-1	2.75	39.5	39.5	-	+				

Table 1
INITIAL VISION OF MORE THAN 0.1

Central Field UN UT LN LT	Time in mos.	D.V.	Pupil	Schütz	Miotic	Bleb	Per. Field UN UT LN LT	Central Field UN UT LN LT	Complications
B. 10 10 8 8 1.5 arcuate	22	0.6	4	16	0	+	45 45 10 50	B. 15 8 6 20	Sch. 90 Homat.
B. 1.5 arcuate	15	1.5-2	3	13.5	0	+	Full	B. Full	
B. 20 3 20 6 arcuate	4	0.8	5	11.5	0	+	No change	B. No change	Bro. glc.
B. 3 8 11 12	4	F. at 8'	5	22	0	0	10 5 10 5	B. 05 05 1.5 1.5	C.D. H. Myo-
	2½	F. 2'	4	13.5	0	+	No change	No change	pia
	1	0.8-3	5.5	14	0	+	No change	No change	C.D. Bl. Sugar
B. 20 20 2 7	24	1.5-4	3	13	0	+	45 52 48 70	B. 20 20 20 8	106
B. 8 8 8 10	15	0.6-2	4.5	24	0	+	50 60 60 60	B. 18 10 5 10	BMR Decomp.
B. Full	29	0.3	3.5	11	0	-	15 10 20 60	L 3 5 15 20	+39° Heart.
B. 10 8 12 12	8	0.6-1	5	10	0	0	45 60 55 90	B. 35 35 38 30	Albumen
B. Sl. enlarged Blind spot	6	0.6	5	23	+	+	Full	B. Full	Ang. Pectoris
B. 5 10 8 9	4	0.6+2	4	29	0	+	50 70 60 90	B. 5 15 18 15	C.D.
B. 28 30 32 39	16	0.8-3	2.5	11.5	0	+		47 48 45 45	Hyst. Obese 7
B. 28 30 40 40	16	1.5-2	3	15	0	+		50 50 50 50	ys. ago
B. 5 30 0 32	12	0.3	3	25.5	0	+		B. 1 5 1 5	BMR -11%
B. 25 30 25 30	15	1.0	2	16	0	0	45 70 50 75	B. 20 25 20 25	
L 3 7 3 8	6	0.4+1	3	20	0	+		R. glc.-Det. Ret.	
B. 25 25 1 9	8	0.6	4	18	0	+	35 50 40 80	B. 45 35 35 15	
L 2 5 10 10	65	0.8+4	4.5	10	0	+		L 5 3 1 1	2 (T) 11th day.
L 20 3 15 5	5	P of L	4.5	31	0	0		B. 2 11 41 48	Sch. 52
20 25 5 5	60	P of L	3	20		+		Arcuate	C.D.
L 2 3 8 8	14	0.8-3	3.5	26.6	0	-	5 50 35 65	Vit. hem. after	Myo. 15 D.
L 1 1 25 25	10	0.5	6	20	0	+	Unchanged	op. and 2 drain.	Ret. hem.
L 4 25 15 25	46	0.2	4×5	23	0	?	20 60 10 68	attempts.	Dense cataract
L 1 1 3 10	42	0.6	1.5	15	0	0	2 8 10 10	0.5 2 yrs. after op.	Sch. same with-
L 5 1 2 1	53	0.3	1.5	39	+	+		L 3 3 4 20	out miotic
L 2.5 2.5 0 0	70	0.1	—	18	0	-	45 60 30 85	L 2 1 3 9	C.D.
L 1 2 3 8	19	0.2	5	15	0	+	25 55 30 75	5 3 3 2	C 7/26/35
L Blind spot 18×13 horiz.	24	0.1	3.5	13	0	-	5 40 35 45	40 2 1½ 1	Lens opaque
	57	0.2+1	2	26.6	+	0	Not taken	L 6 2 10 10	0.6-3 for 5 yrs.
	37	0.3-1	3	15	0	+	35 40 42 45	B. 10 12 8 10	C.D.
L 15 20 5 9	22	0.3-1	—	18	0	+		L 6 8 6 7	Bl. sugar 2.54.
L 10 10 9 5	45	0.1	1.75	30	0	+	5 25 10 22	L 9 10 5 5	Ret. hem. Cat.
L 1.5 3 3 4	18	P of L	—	15	0	+	Lenses opaque 3	L 9 10 5 5	C.D. Lens
L 3 7 10 20	18	P of L	—	15	0	+	Lenses opaque 3	L 6 5 5 4	opaque
L 4 5 2 4	15	0.5+1	—	12	0	+	5 5 8 8		C.D. Lens
	26	F. at 2'	—	23	0	+			opaque
B. 20 25 20 12	20	0.5-2	3	23	0	+	5 5 32 60	B. 18 20 18 15	-5 D. L. Cat.
L 1 4 2 5	33	0.2	3.5	15.5	0	+		L 1 1 10 20	and gl.=1.2
L 1 5 1 5	14	0.3	2.5	18	0	-		L 1 4 1 6	Hyphema Lens
L 10 10 12 12	27	1.0+3	2.5	25	0	+	55 60 50 80	B. 28 41 39 35	opacities
L Full	27	0.6-2	3	25	0	+	15 10 5 70	arcuate below	Pernicious ane-
L 4 10 5 10	13	P of L	4	20	0	+	30 60 60 80	R.L. Sch. 9th month	mia
arcuate	49	1.2	1.5	17.5	+	+	35 55 52 50	L 2 6 3 10	2d op. in 26
L Full	96	0.4	4	20.5	0	+		L Blind spot 10×10	mos.
	17	1.0	2.75	17	0	+			

Table 1 (continued)

INITIAL VISION OF MORE THAN 0.1

No.	Sex	Age	B.P.	Hyperopic	Previous Oper.	Eye	Operation	D.V.	Pupil	Sch. High	Sch. Low	Degree of Fixation	Glc. in mate	Per. Field			
														UN	UT	LN	LT
48	F	35	165/105	+	0	R	Ir	0.5	5.5	47.5	18.5	—	+	40	55	40	70
49	M	69	—	0	0	R	T	0.6	4.5	—	27.5	6	+	10	65	50	75
50	M	69	—	0	0	L	T	0.3+1	4.5	—	36.5	2	+	2	15	20	50
51	F	57	—	+	0	R	Ir	F. at 4'	5	60	40	—	+	55	75	55	80
52	F	39	—	+	0	R	T	0.5-1	2.75	38	22	—	+	52	65	52	82
53	F	73	—	+	0	R	T	0.4+1	3	31	31	2	+	50	80	40	65
54	F	67	154/82	+	0	R	L	1.2	3.5	30	20	—	+	30	45	50	65
55	F	57	—	+	0	R	T	1.5	3.5	55	28.5	5	+	8	40	20	65
56	F	57	—	+	0	L	T	1.0-4	3.5	44	28.5	2	+	15	35	35	35
57	F	61	150/90	+	0	L	H	0.3	5	30.5	30.5	—	+	45	60	70	70
58	F	52	—	+	0	R	T	0.8	2	41	35	—	+	45	50	50	70
59	F	37	150/90	+	0	R	T	0.8-3	2	66	20	—	+	50	50	45	40
60	M	51	—	+	0	R	H	1.2	4	51.5	22.5	8	+	35	80	4	5
61	M	51	—	+	0	L	H	1.5-2	4	44	18	—	+	55	80	60	75
62	M	49	180/110	+	0	R	H	1.2	4	66	43	—	+	10	50	10	0
63	M	49	180/110	+	0	L	H	1.2-1	4	58	39	—	+	50	70	25	80
64	F	67	150/80	+	0	R	T	0.4-2	2	—	16	—	+	30	40	45	70
65	M	73	—	+	0	R	Ir	0.2	5	35	35	—	+	vertical	arcuate		
66	M	73	—	+	0	L	T	1.2-3	4.5	30	30	2	+	30	30	40	35
67	F	60	—	+	0	L	T	1.0-3	5	51.5	40	2	+				
68	F	54	—	+	0	R	Ir	0.3	1.75	62	44	—	+				
69	F	58	130/84	+	0	R	T	1.2	1.5	77	23	—	+	25	60	10	10
70	F	58	130/84	+	0	L	T	1.2	1.5	49	29	2	+	25	65	15	10
71	M	63	134/68	+	0	R	T	0.3	2.75	26	26	—	+	55	60	50	72
[72	M	63	134/68	+	0	L	T	0.4	3.5	28	28	—	+	50	75	55	80
73	F	47	?	+	0	L	T	1.2	3.25	69	35	—	+	50	65	40	80
74	M	74	176/90	+	0	R	T	0.6+2	3	86	16	—	+	10	45	10	35
75	M	69	128/66	+	0	R	T	0.6-1	2.0	35	30	—	+	45	55	50	80
76	F	80	224/110	+	0	L	T	0.4-1	2.5	54	52	—	+	28	25	30	50
77	M	63	145/85	0	0	L	L	0.2	2.5	56	56	—	+	11	50	33	70
78	F	64	175/90	+	0	L	H	1.0	2.5	39	26.5	6	0	40	70	50	75
79	M	69	190/106	+	0	L	L	0.8	3	48	48	—	+	55	80	40	90
80	M	62	160/88	+	0	L	T	10/200	4	48	48	6	+	30	65	30	70
81	M	79	130/70	+	0	R	Ir	12/200	3.5	33	26.6	—	+	55	60	20	80
82	F	51	150/90	+	0	L	T	HM at 2	5	85	20	1	+	8	50	28	55
83	M	54	150/75	+	0	R	Ir	15/200	2.5	48	48	—	+				
84	F	80	224/110	+	0	R	T	0.2-1	2.5	52	52	5	+	5	10	5	45
85	M	71	170/80	+		R	Ir	0.4-2	1.5	56	33	—	+				
86	F	70	160/89	+	0	L	Ir	0.3	3.5	80	40	—	+	40	20	15	55
87	M	69		±	0	R	T	0.2+1	5	—	24	2 1/2	+				
88	F	67		+	0	R	T	0.1	4.5	—	39.5	—	+				
89	F	67		+	0	L	T	0.2	4.5	—	27.5	1	+				
90	M	50	120/70	+	0	L	T	0.4	2.5	40	22	1 1/4	+	20	12	15	5
91	M	26		0	0	R	Ir	0.6	4	60	30	—	+	15	15	30	60
92	M	26		0	0	L	Ir	0.6	4	75	40	—	+	40	45	10	15
93	F	61	128/64	+	0	L	T	0.2-1	3.5	46	28	1	+	25	20	25	40
94	M	74	—	+	0	R	H	0.2-1	5	46.5	45	1	+	1	1	50	40
95	F	25	—	0	0	R	T	0.1	5	43	22	—	+	10	45	55	60

Table 1 (continued)

INITIAL VISION OF MORE THAN 0.1

Central Field UN UT LN LT					Time in mos.	D.V.	Pupil	Schiotz	Miotic	Bleb	Per. Field UN UT LN LT				Central Field UN UT LN LT				Complications
L 6 6 8 6	37	0.8-2	4×6	17.5	0	0	50	40	50	70	L Full Bl. spot 10×10 L 1 2 10 10	Intro. BE after op. Lenses ++ clouded. My- opia R and L 8 D. Lens clouding							
L 2 5 10 10	30	0.1	4	20	0	+	10	55	55	80									
L Full 7×8° Blind spot	30	0.4	5	26.6	0	0	55	75	55	85	L No change	Postop. Iritis cataract Enucleation in 13 mos.							
L Full. Blind spot 10×10	20	0.5	2	13.5	0	+	Unchanged				L Unchanged								
L 10 2.5 2 2	51	P of L	2×5	16	0	+					Buttonholed flap				Lens opaque				
B. 22 35 25 25	13	Nil		20	0	+	3 mos. later				Inf. began 10 days after op. shrinking								
L 5 5 8 8	60	1.5-2	3	20.5	0	+	50	65	50	85	L 4 8 3 5								
L 2 2 3 2	60	0.5+2	3	14.5	0	+	20	65	30	50									
	72	0.2	3	15	0	+	5	30	10	10	L Full field B. Full Bl. spot 2× L 5 5 5 5	Op. by Holth							
B. 20 16 15 20	108	1.2	2	20	+	+	55	40	50	40									
B. 10 10 8 7.5	48	1.0-3	2	14	+	+	50	55	40	70	L 8 4 8 5	Oslo Op. by Holth							
	124	0.8-3	2	17.5	0	+	50	65	60	80									
B. Full field	124	1.2	3	16	0	+	In T field 70×50 seeing area								Oslo				
	20	0.3-1	3.5	15.5	0	+	50	60	22	82									
	20	1.0-4	3.5	11	0	+	25	70	5	30									
L Bl. spot 11×14 below	45	0.2	3.5	20		+	25	70	25	80	No change				Marked lens clouding C.D.				
	15	H.M. at 2'	—	22.5	0	0	50	45	45	60									
L 2 4 10 10	15	0.8-3	—	13.5	0	+	35	40	40	45	L Bl. spot 1.5× arc- uate above	Diabetic Expulsive hem. of ch.							
L 10 20 2 4	8	0.8+6	4	18	0	+					L 10 20 8 4								
	4	Shrinking enucleation																	
B. 5 10 10 2	37	0.8	3	11.5	0	+	8	50	10	10	B. 9 30 9 10	L. cyclo. 1 yr. Reopen L and T 5 mos. later WR ++. By mail 15 mos. O.K.							
	37	0.8+2	3	13	0	+	10	55	10	10	B. 3 12 6 8								
B. 22 30 23 28	2						Enucleation in 40 days. Severe iritis S.O.?								C.D. C.D. 2 mos. C.D. Repaired cat. ext. 7. D. myopia myocarditis				
B. 38 40 42 45	2	0.8-4	4.5	20	0	+	Full				Full								
Full	17	1.0+1	4	20	0	+	55	65	50	80	Full				Hypert. heart -4D.				
B. 35 35 35 35	2	0.5-1	4.5	15	0	+	20	32	55	32									
	27	0.6+2	4.5	16.5	0	+	25	35	40	50	15 35 35 35								
O.K. Bl. spot 18×30 horiz.	2	0.2+1	2.5	10	+	0					B. 10 12 8 10				Lens opacities C.D. Lens opac- ities Alb. Chr. Pro- static Healed Tb.				
L 10 15 6 8	31	0.4	3	23	0	+					B. 9 8 9 9								
	9	1.5-2	2.5	25.5	+	0	53	70	51	80	B. 15 30 30 30								
L 9 10 5 6	26	1.0+1	3	13	0	+	55	45	50	65	L Full								
B. 42 42 10 12	3	0.6-2	3	6	0	+	30	65	30	70	L No change								
	9	0.6-3	3.5	27	0	0	50	70	12	70	L 20 20 6 9								
L 1 1.5 3 10	41	0.4-2	4	11.5	+	+	8	40	30	65	L 1 1.5 10 10	Opacities Opacities							
	8	0.5-2	4.5	29	0	0	15	65	35	5									
	24	3/200	2.5	26.5															
B. 18 25 11 35	9	3/200	3×6	28	+	0	Sallmann Cyclodi 2 mos. after Irid.				B. 10 22 12 30								
L 10 10 10 10	60	H.M. at 5'	5	30.5	0	0	Cat. in 2 mos. 0.4 in 5 mos.				L 0 6 0 7								
L 1 10 .5 3	48	0.8-2	2.5	10	0	+					L 2 1 2 3								
L 4 3 2 5	25	0.1	—	12	0	+					L 1 1 1 1								
L 1 1 3 5	25	0.2-1	—	12	0	+					L 1 1 2 6								
L 10 10 2 1.5	5	0.4+1	—	20.5	0	+					L 10 35 2 3								
	10	0.4-2	5	47	+	0	25	35	20	60	L 3 2 10 10	Parker and Slocum '22 Parker and Slo- cum '18 Diabetic Bl. sugar .133 WR+ Lens ++ opaque High myop. 14 D. Choroidi- tis WR neg.							
	51	0.3	6	31.5	+	0	60	36	8	30	L 9 9 2 1								
B. 1.5 18 12 18	28	8/200	15	20	+	+	10	20	10	22	B. 5 .5 1 1	L 1 2 8 10							
							Lagrange in 5 mos.												
L 1 2 8 20	3	0.1	5.5	13.5	0	+													
B. 18 18 18 18	50	H.M.	4	18	0	+					B. Same in 2 yrs.								

Table 2

INITIAL VISION LESS THAN 0.1

No.	Sex	Age	B.P.	Hyper- opic	Previous Oper.	Eye	Opera- tion	D.V.*	Pupil	Sch. High	Sch. Low	Degree of Fixation	Glc. in mate	Per. Field UN UT LN LT
1	F	25	—	0	0	L	T	P of L	5	31	27.5	—	+	25 50 50 50
2	F	60	—	+	0	Lr	C	Nil	5	51.5	51.5	—	+	
3	F	62	—	+	0	R	T	P of L	4	100	80	—	+	
4	F	52	—	+	0	L	T	8	2	44	35	—	+	
5	F	61	150/90	+	0	R	Ir	8/200	6	62	51.5	—	+	
6	M	60	150/90	+	0	R	C	16/200	3	39	26	5	0	
7	F	57	—	+	0	L	Ir	2	6	40	40	—	+	
8	F	35	165/80	+	0	L	Ir	P of L	7.5	88	72	—	+	
9	F	59	—	+	0	L	T	H.M.	5	59.5	27	—	+	
10	F	47	—	+	0	R	H Ir	Nil	5	85	85	—	+	
11	F	60	—	+	0	L	T Ir	0.1	5	40	21.5	3	+	RV = 0.2 (8 yr. be- fore) 45 50 55 60
12	M	63	108/70	+	0	L	L	0.1	2.5	56	48	0	+	
13	M	68	153/75	+	C	L	T	H.M.	4	55	45	—	+	
14	M	69	145/90	+	0	R	It	2	4.5	52	39.5	—	0	
15	M	60	140/95	+	0	L	H	H.M.	2	63	50	—	+	
16	F	74	180/90	+	0	R	L	20 Nil	4.5	75	69	—	+	
17	M	41	—	+	T	L	L	7	5	60	60	—	+	
18	F	66	220/120	+	0	R	L	3	6	63	—	—	+	
19	F	66	220/120	+	0	L	L	Nil	5.5	101	—	—	+	
20	F	59	—	+	2	R	VF	Nil	5	80	50	—	+	
21	F	59	—	+	0	L	T	2	5	75	52	1	+	5 05 05 05
22	M	65	—	+	0	L	T	3	3.25	42	17		+	
23	M	65	158/90	+	0	R	R	H.M.	1.75	36	22		+	
24	M	75	148/80	+	0	R	T	7/200	3	31	13		+	
25	M	75	148/80	+	0	L	T	4/200	3	31	13		+	
26	M	60	135/68	0	G and C	R	T	2	2.5	45	29		+	
27	M	50	135/68	+	0	L	T	5/200	5.5	51	23		+	
28	M	67	—	+	0	Ir	T	Nil	6.5	52	52		+	
29	M	69	126/70	+	0	R	T	H.M.	3.5	56	15.5		+	
30	F	70	170/90	+	0	L	T	2	4	42	35.5		+	
31	F	62	200/100	+	0	L	L	P of L	4	101	101		+	
32	F	74	150/80	+	G and C	L	T	3	5.5	56	35		+	
33	M	79	130/70	+	0	L	T	3/200	3.5	56	26.6	0	+	+
34	M	64	115/70	+	0	L	T	2	—	50	20		+	
35	F	67	180/98	+	0	L	T	Nil	6	86	86		+	
36	F	47	—	+	0	R	T	Nil	2.75	77	48.5		+	
37	M	68	154/100	+	0	R	T	P of L	4.5	56	20		+	
38	F	76	180/90	+	0	R	H	P of L	4.5	120	80		0	
39	M	48	86/60	+	0	R	T	6	5.5	36	27.5		+	
40	M	53	140/70	+	0	R	T	P of L	5.5	61	27.5		+	
41	F	60	190/94	+	0	R	T	2	5	66	28		+	
42	F	62	190/98	+	0	L	Ir	Nil	2.5	94	63		+	
43	M	59	194/104	+	0	R	L	Nil	6.5	86	54	0	+	+
44	F	72	108/60	+	0	L	T	7/200	2	48	22		+	
45	F	44	250/180	+	0	L	C	5	3	35	20		+	
46	F	59	—	+	0	L	T	1	5	75	52		+	
47	M	69	—	+	0	R	T	2	5	—	33.5		+	
48	F	69	—	+	0	L	T	8	1.5	39	27.5		+	

Table 2

INITIAL VISION LESS THAN 0.1

Central Field UN UT LN LT					Time in mos.	D.V.	Pupil	Schiotz	Miotic	Bleb	Per. Field				Central Field				Complications		
UN	UT	LN	LT	UN							UT	LN	LT	UN	UT	LN	LT				
B. 25 30 5 20 arcuate					50	P of L	6.5	16	0	+								Lenses opaque			
					10	Nil	2.25	18	0	0								Diabetic			
					8	Nil	4	60	+	0			Photo Lac. Red.		Enucleation		Thyroidectomy 1928				
					108	P of L	2	40	+	0								Lens opaque			
					14	P of L	6.5	25	0	0			4 yrs. RV=0.1 50 60 55 85				RV=0.6-3 in 6 mos. 0.1 in 13 mos.				
					26	P of L	5	23	0	0			Lagrange in 6 mo. Cyclod. 13 mos. Cat. in 15 mos.				Occasional L. pain				
					54	4	5	54	0	0											
					1	P of L	7	?	0	0			Hem. in CA—ruptured W.d. Enuclea- tion in 1 mfo.								
					2	H.M.	4	16	0	+											
					18	Nil	7	60	+	0							Pain				
L 5 0 0 9					66	15	4×6	18	0	0								Lens opaque			
					13	P.L.	3.5	25	0	0			E.T. 6 wks. later; pneumonia and pros- tatectomy				Lens opaque. Occasional pain.				
					4	Vit. hem. with cyclo.															
					5	P.L.	2.5 ×5.5	20	0	+			E.T. 2 wks.; Lagrange 5 days later. Vit. loss. Cat. 2 wks. later. Shrink. enucl. in 4 mos.				L. prothesis Accident 30 yr. ago.				
					17	4	3.5	30.5	0	0			Ret. hemorrhages				Lens clouded				
					3	Nil	6.5	15.5	0	0					Ret. hemorrhage						
					3	P of L	7	12	0	0			L. Scl. below following week				Lens opaque Sl. pain				
					23	P of L	7.5	8	0	4			L. Cat. 1 mo. later				R and L E.T: 1930. Lenses ++ clouded				
					23	Nil	5	10	0	0			R. cat. and iridectomy 7 mos. later with vascularized cornea				Diabetic Lenses opaque				
					7	Nil	5	80	-	-			Enucleated				2 E.T. before Vit. 1st op.				
E.T. 13 mos. Vit. prolapsed Buttonhole conj. Vit. prolapsed L 5 10 3 5					15	6	—	12	0	+			2	5	5	5	1.5	3	3	1	C.D.
					54	P of L	4.5	18	+	+											
					12	P of L	—	25	0	+											
					4	15/200	3	18	+	+											
					4	5/200	3	13.5	+	+											
					22	P of L	4.5	33	0	0											
					70	2/200	4	18	-	-											
					18	Nil	6.5	15	+	+											
					57	H.M.	2	29	0	0											
					15	H.M.	—	N	+	+											
L 1 1 3 15 L 1 1 2.5 25					55	P of L	5	30	0	0											
					19	P of L	5.5	13.5	0	+											
					17	2	3.5	9	+	+											
					14	3/200	2.5	19	0	0											
					13	Nil	5	—	+	0											
					5	Nil	4	20	0	0											
					37	H.M.	5×7	19	+	0											
					—	—	—	—	+	+											
					4	6	4.5	14	0	+											
					3	P of L	3.5	15.5	0	+											
Died. Hypertensive nephritis					10	7/200	6	10.5	+	+											
					18	Nil	1.5	17	0	+			Sch. 53, 1 mo. after op. Massage and es- erine OK.								
					3	Nil	5	45	+	+											
					72	3/200	3.5	21.5	0	+											
					3	5/200	3	20	0	+											
					15	6	—	12	0	0											
					48	2	2.5	12	0	+											
					4	Nil	2	8	-	-											
					—	—	—	—	—	—											
					—	—	—	—	—	—											

Explanation of Abbreviations

Operations

Ir == Iridectomy
 T == Elliot trephining
 H == Holth
 L == Lagrange
 C == Cyclodialysis
 VF == Vitreous fistula
 It == Iridotaxis

Vision
 H.M. == Hand movement
 P of L == Perception of light

* Figure in D.V. column, Table 2,
 indicates finger counting at that
 number of feet.

Fields

B == Bjerrum screen
 L == Lloyd stereocampimeter
 UN == Upper nasal
 UT == Upper temporal
 LN == Lower nasal
 LT == Lower temporal
 C.D. == Choroidal detachment

to nine years on medical care and found only five which retained their initial vision and fields.

Five eyes were blind or industrially blind. One had been enucleated before admission. One was blind on admission after iridectomy for glaucoma and one blind from diabetes. The others had vision of finger counting at $2\frac{1}{2}$ feet and six inches respectively when admitted to the hospital.

Results of operations on eyes with less than 0.1 vision (table 2). The vision in most instances was so poor that reliable fields could not be taken; the results, therefore, must be given in terms of vision and tension.

Of the 30 eyes undergoing Elliot trephining operations, 15 had normal tension with better or as good vision as before operation.

Eight patients had poorer vision, but normal tension.

Five eyes were enucleated following trephining operations; two for post-operative inflammation and shrinking. A third, which had undergone a Lagrange operation and a cataract extraction after the trephining, was removed because of pain and shrinking of the globe. A fourth had a ruptured wound with hemorrhage and the fifth had severe pain and high tension.

Two eyes had very high tension remaining after trephination.

Iridectomy was done in four cases of this group. Two eyes remained unchanged. One was unchanged for four years, then the vision became worse though the tension remained normal. One eye had a rupture of the wound with hemorrhage the seventh week and had to be enucleated.

The Holth sclerectomy was performed in three cases with absolute glaucoma. In one a trephining was done 13 months later and a vitreous prolapse occurred. In the second there was continued high tension with no pain; in the other an expulsive choroidal hemorrhage.

The Lagrange sclerectomy was performed on eight eyes. Two were improved both in vision and tension. In another with high blood pressure the vision remained the same, but the tension was high. In one the vision was

worse and the tension remained high. In three others the vision was poorer though the tension was normal. All of these required another operation to keep the tension normal. One of them had an iridectomy and cataract operation seven months after the Lagrange sclerectomy; a second required a trephining three years later and the third a trephination six weeks after sclerectomy. In the eighth case, a blind painful eye had a vitreous-fistula operation but was subsequently enucleated for relief of pain.

Cyclodialysis was performed in three cases of this series. In one, the vision was unchanged and the tension was normal. In the second the vision was worse but the tension was normal. The third had 0.6 vision for six months and a Lagrange operation kept the vision at 0.1 for 13 months.

Iridotaxis was performed in a single case of hemorrhagic glaucoma. The vision was perception of light though the tension was normal.

It is interesting to note the condition in the remaining eye of patients blind before or after operations for glaucoma. There were 13 eyes blind before the operations reported in this paper. One eye had been lost through an accident 30 years before. One had been trephined for glaucoma before admission. Two had been removed because of pain from glaucoma and the other nine were blind from glaucoma but were not having symptoms from it. Two patients had no glaucoma in the remaining eye. Eleven patients had vision of from 0.3—1 to 1.5 in the mate for periods ranging from eight months to nine years. One had vision of only hand movements 18 months after the operation on the second eye. One patient had had an iridectomy on the first eye and retained 0.4 vision for the nine years before the second eye was lost. All had normal tension in the second eye though five required miotics to keep it normal. One patient died eight months after the operation but her vision was still 0.6—3 up to that time.

The following are brief summaries of the pathological findings of the enucleated eyes in this series:

Table 2, no. 38

Unhealed and unclosed operative wounds
(2) of the corneoscleral junction
Prolapse of ciliary body and retina into the wound tract
Rupture of lens capsule with traumatic cataract
Iridectomy
Inflammatory pupillary membrane
Serous uveitis
Edema of choroid and engorgement of choroidal vessels
Serous detachment of retina
Peripheral anterior synechiae
Posterior sclerotomy wound and
Vitreous hemorrhage opposite this wound

Table 1, no. 54

Active postoperative parenchymatous keratitis and corneal edema
Anterior-root synechiae
Serous iridocyclitis
Prolapse of uvea between wound lips
Remnant of lens capsule present and dislocated toward the region of the wound
Peripheral iridectomy
Serous total retinal detachment
Choroidal and retinal perivasculitis
Edema of ciliary body and
No glaucomatous excavation

Table 2, no. 3

Total anterior synechiae
Posterior synechiae
Complicated cataract
Healed incision in scleral-spur region with some prolapse of uvea
Connective-tissue sward in retrolenticular space
Connective sheath in subchoroidal space (like a tapeworm)
Subluxation of the lens
Total retinal detachment
Mild chronic uveitis
Optic-nerve atrophy and
Glaucomatous excavation filled with glial proliferation

Table 2, no. 20

Anterior-root synechiae
Cyst of iris pigment layer
Serous iridocyclitis
Partial obliteration of anterior chamber
Edema and congestion of ciliary body and choroid
Sclerosis of choroidal vessels
Complicated cataract
Total detachment of retina
Subretinal hemorrhage with cholesterol crystals
Posterior synechiae
Connective-tissue sward in retrolenticular space
Keratitis parenchymatosa
Occlusio and seclusio pupillae and
Slight outward bending of lamina cribrosa but no clear-cut glaucomatous excavation

Table 1, no. 68

Postoperative parenchymatous keratitis

Prolapse of the uvea
Insinking of corneoscleral wound
Operative iridectomy
Subchoroidal and choroidal hemorrhage
Subretinal and ciliary-body hemorrhage
Edema of choroid and ciliary body
Nodular choroiditis
Avulsion of retina from optic-nerve head and prolapse of retina
Cholesterol crystals
Bone formation in choroid and
Aphakia

Table 2, no. 8

Prolapse (or herniation) of iris, ciliary body, and lens through the operative wound
Avulsion of retina
Anterior-root synechiae (minimal)
Glaucomatous excavation filled in with new-formed connective tissue
Questionable central-vein thrombosis
Postoperative parenchymatous keratitis
Edema of choroid and ciliary body

Table 2, no. 48

Subacute endophthalmitis with
Hypopyon and hyphema
Vitreous hemorrhage
Subacute iridocyclitis
Complicated cataract
Atrophy of the iris
Hemorrhage in iris
Perivasculitis of retina and
Ulcerative keratitis

Table 2, no. 27

Traumatic cataract (rupture of the anterior lens capsule)
Atrophy of iris, ciliary body, and choroid
Glaucomatous excavation (flat)
Retinal, subretinal, and choroidal hemorrhages
Anterior episcleral infiltration and
Hemorrhagic retinitis

Table 2, no. 45

Eye was obtained at post mortem
Advanced obliterating endarteritis (especially the central retinal artery)

Table 2, no. 13

Insinking of operative wound with over-riding of corneal lip
Edema of the cornea and postoperative parenchymatous keratitis
Serous detachment of the choroid
Edema and hyperemia of the choroid
Complete serous detachment of the retina
Cyclitis
Anterior synechiae
Aphakia
Hemorrhage and capsular proliferation in the cyclitic membrane and
Avulsion of optic-nerve head

Table 1, no. 71

Trephine of cornea (filled with connective tissue)
Peripheral (operative) iridectomy
Anterior peripheral synechiae

Inflammatory pupillary membrane
Fibrinous iritis
Atrophy of iris and ciliary body
Verruca of lamina vitrea of the choroid

There is no evidence of glaucomatous excavation of the optic nerve. The retina and choroid are essentially normal. The retinal and choroidal vessels do not reveal any changes of a sclerotic nature, and no hemorrhages are seen. This patient probably had an attack of glaucoma and after the trephination reacted with an exudative iritis. With the formation of a pupillary membrane and closure of trephine opening, there was a recurrence of the glaucoma (perhaps secondary), causing the excessive pain which was the primary cause for enucleation.

Thirteen eyes with hydrophthalmos are presented. The ages of these patients ranged from $3\frac{1}{2}$ months to seven years. In the series were two brothers aged 5 and 7 years. The father had megalocorneae with normal vision and tension. Both eyes of the brothers were operated upon. The vision in the younger is R.E. 3, L. 5/200, and in the elder R.E. 2+1, L. perception of light after operation. Two operations were performed on the right and four on the left eye of the elder. The younger underwent two operations on his left eye.

Most of these patients were too young to allow accurate vision or tension to be recorded. One $3\frac{1}{2}$ -month-old infant has already had two operations. In one case, observed for 18 years, vision has been maintained at 0.6—3 with full peripheral and Bjerrum fields to date with one trephine operation. Vision in the other eye is only percep-

tion of light following three trephine operations. This patient had an hypopyon in his better eye 10 years ago. In spite of many attacks of conjunctivitis and hordeolum, this was his only infection; in fact, it was the only late infection in this series.

Twelve trephinings and one Langer sclerectomy were performed on these patients, who are yet too young and have not been under observation long enough to allow any conclusions to be drawn as to the ultimate results. Only a filtration operation can be expected to bring about improvement in such cases.

Summary and conclusions

The anterior chamber was shallow and the cornea steamy when the tension was more than 50 mm. Hg.

The "middle pressure" was approximately the same as the intraocular tension in glaucomatous eyes under miotics and closely approximated that figure in patients with less than 50 mm. of pressure.

Fields constricted to within a few degrees of the fixation point in glaucomatous eyes are no contraindication to surgical treatment.

One late infection in fistulating operations occurred among 156 eyes and this one recovered 0.6—3 vision.

The Elliot trephining operation was found to be the most satisfactory surgical procedure in chronic glaucoma.

122 South Michigan Avenue.

References

- ¹ Salvati, G. Rev. ottal. Oriente, 1934, v. 4, pp. 63-68.
- ² Eerola, A. Acta Ophth., 1935, v. 12, p. 137.
- ³ Kotljarewskaja. Sovietskii Viestnik Opht., 1935, v. 6, p. 58.
- ⁴ Del Barris, A. Arch. de Oft. Hisp.-Amer., 1935, v. 35, p. 355.
- ⁵ Etienne, J. Ann. d'Ocul., 1935, v. 172, p. 827.
- ⁶ Philippow, N. Sovietskii Viestnik Opht., 1935, v. 6, p. 51.
- ⁷ Knapp, A. Arch. of Ophth., 1933, v. 10, p. 298.

OCULAR CHANGES IN MULTIPLE SCLEROSIS

DON MARSHALL, M.D. AND R. G. LAIRD, M.D.*

ANN ARBOR, MICHIGAN

Ocular changes in multiple sclerosis are frequent, and may be listed as: (1) changes in the extraocular muscles; (2) pupillary abnormalities; (3) nystagmus; (4) fundus changes, confined to the nerve head; (5) retrobulbar neuritis; (6) changes in the visual fields. The frequency of these manifestations in a series of 100 consecutive cases of multiple sclerosis is presented. A case report is detailed in which the diagnosis was made by exclusion and by hemianopic field changes. From the Department of Ophthalmic Surgery, Medical School, University of Michigan.

In about half of all cases of multiple sclerosis there are visual disturbances at some time. The disease usually is rich in ocular symptoms, since the degeneration plaque may develop at any part of the visual pathway. More important is the fact that the ocular symptoms are often the first manifestation of the disease, with none other appearing for perhaps many years, the longest reported remission having been 32 years.¹ The early ocular signs may be overlooked by both patient and physician, because they are so transient. Since statistical studies of a series of multiple-sclerosis patients from the ocular aspect are not very numerous or very recent, this summary of such a review of 100 cases, together with the detailed report of a case showing only visual-field changes of hemianopic type, is offered both as a corroboration of previous authors, and as a reminder to ophthalmologists and neurologists of the important part that the eye plays in the diagnosis of the disease.

General facts

Multiple sclerosis is a disease of unknown etiology occurring usually in patients between the ages of 20 and 40 years. Next to syphilis it is the most frequent disease of the nervous system, and in private practice may exceed syphilis. It is rarely found in patients under 12 years or over 50 years. Our patients averaged 27.9 years at the onset of their first symptoms, and 31.8 years when first admitted to the hospital. The average of four years between onset and first medical consultation agrees exactly with the figure of Birley and Dudgeon.² Age at the onset of first

symptoms ranged from 11 to 48 years. The cases were about evenly divided as to sex, though most authors have found a definitely higher frequency in females.

Table 1

GENERAL DATA ON A SERIES OF 100 CONSECUTIVE CASES OF MULTIPLE SCLEROSIS

Total number of patients: 100	Males: 52 Females: 48
Average age when first admitted:	31.8 years
Average age at onset of first symptom:	27.9 years
Diagnosis of multiple sclerosis proved at autopsy:	1
Diagnosis of multiple sclerosis positive on eye findings only:	1
Additional diagnosis of psychoneurosis:	4
Did not have examination by an ophthalmologist:	25
Blood Kahn reaction negative:	100

The series of 100 patients reported here presented consecutive, unselected cases so diagnosed by the Department of Neurology, excluding only those in which the diagnosis was uncertain. Of this group 75 percent had a routine examination by the Department of Ophthalmology. The blood Kahn reaction in each case was negative. Diagnosis was based on clinical findings, proved in one case at autopsy, and on eye findings alone in the single case detailed below.

History

Every possible symptom of any neuropathology may be found in multiple sclerosis. Ocular complaints consist usually of reduced visual acuity or blurring, diplopia, and sometimes field defects noted subjectively. Adie found that when the onset of the disease was characterized by one symptom, these were usually (40 percent) ocular.¹ The course is usually irregular or discontinuous. Visual symptoms are very im-

* Grand Rapids, Michigan.

portant in the early diagnosis of the condition. They are often mistaken for those of psychoneurosis, retrobulbar neuritis, tabes, and toxic amblyopia. The visual disturbance may be unilateral or bilateral, often develops quickly, and usually is transient, leaving little or no permanent defect. Seldom are both eyes affected seriously at the same time. Temporary poor vision may be the only evidence of multiple sclerosis manifested for many years. Permanent complete blindness is extremely rare, so that a good prognosis for vision can always be given.

Table 2

SYMPTOMS, TIME OF THEIR ONSET, AND VISION,
IN 100 CASES OF MULTIPLE SCLEROSIS

History

Symptoms noted by patient

Percent

Poor vision:	42	} 52 percent of all patients
Field defects:	3	
Diplopia:	22	

Course of ocular symptoms

Percent

No remissions:	5
At least one remission:	23
Progression of symptoms:	7
Regression of symptoms:	15

Onset of ocular symptoms before onset of others: 16 percent

Percent

Less than 3 months before:	6
Less than 1 year before:	4
Less than 5 years before:	5
Less than 10 years before:	1

Onset of ocular symptoms after onset of others: 35 percent

Percent

Less than 1 month after:	9
Less than 6 months after:	9
Less than 1 year after:	3
Less than 5 years after:	9
Less than 10 years after:	4
Less than 15 years after:	1

Vision

Best obtained except when vision was observed to fail and recover.

Majority were examined only once.

	O.D.	O.S.
6/6	26	30
6/9	22	21
6/12 to 6/30	12	17
6/60 and less	11	3

Table 2 presents a summary of the ocular symptoms of 100 patients. In one third of the patients who had ocu-

lar complaints, these preceded all other symptoms of the disease, sometimes by a period of many years. In this series 52 percent noted poor vision, a field defect, or diplopia at some time in their history. This figure agrees with those of Uhthoff³ and later writers. We found only about one sixth of the series starting with visual symptoms.

Examination

Ocular abnormalities in multiple sclerosis may be listed as: (1) changes in the extraocular muscles. These may cause diplopia. (2) Alterations in the pupillary reactions. (3) Nystagmus, in some cases due to the muscle changes. (4) Fundus changes, confined to the nerve head. (5) Retrobulbar "neuritis." (6) Changes in the visual fields. (7) Reduced visual acuity is due to one of the last three factors, perhaps rarely to nystagmus.

Vision

A history of blurring or a sudden loss of vision lasting for days or weeks is valuable evidence in confirming the diagnosis. Lacking this, subnormal vision alone must be considered with skepticism, unless a careful refraction is performed. Routine refraction was impossible in most of the patients in this series. Poor vision may be due to pathology, as a central scotoma or optic atrophy, or merely to an error of refraction. The vision given in table 2 is the best obtained at the time of examination, except in those cases where, under observation, vision failed, due, undoubtedly, to the disease.

Nystagmus

Statistics on the frequency of nystagmus vary widely, owing at least in part to inconsistency in separating nystagmoid jerks and true nystagmus. All authors agree that the latter is of infinitely greater diagnostic importance. The two cannot be satisfactorily divided except in their extremes. Figures on several series, compiled by Brain,⁴ give a majority estimate as 70 percent, and this was exactly our figure, if all types of nystagmus and nystagmoid jerks are added (table 3). A commission on mul-

multiple sclerosis in 1922⁵ decided that in this disease nystagmus is the most frequent motor disturbance in the sphere of cranial-nerve innervation. Some writers⁶ believe that only high degrees can be relied upon in reaching a diagnosis. Klingmann⁷ noted that early blurring of vision might be due to weak innervation of the extraocular muscles causing nystagmus, but not reaching the stage of diplopia. Williamson-Noble⁸ believes that apart from brain tumors, nystagmus is found most com-

ments. Uhthoff was first to note that the external rectus is affected oftener than any other muscle. He found a muscle paralysis in 20 percent. Our series showed it in only 10 percent, divided as shown in table 3. The details compare fairly closely with those of Sachs.¹¹

Paralyses of the extraocular muscles in multiple sclerosis are rarely permanent, being usually transient and incomplete. Complete ophthalmoplegia is very rare, though Veraguth¹² has described total ophthalmoplegia interna.

Table 3

EXTERNAL FINDINGS IN 100 CASES OF MULTIPLE SCLEROSIS

Nystagmus:

Absent: 30 percent

Only nystagmoid jerks: 16 percent

Nystagmus in horizontal plane: 34 percent

Nystagmus in horizontal and vertical planes: 17 percent

Rotary nystagmus: 1 percent

Rotary and horizontal nystagmus: 2 percent

Anisocoria: 16 percent

Miosis: 0

Atypical Argyll Robertson pupil: 2 percent

Muscles:

Weakness of lateral rectus only: 9 eyes in 5 patients

Weakness of mesial rectus only: 3 eyes in 2 patients

Weakness of other muscles of iii* only: 4 eyes in 2 patients

Weakness of lateral rectus and some of iii*: 2 eyes in 1 patient

Normal muscles in 90 percent of patients.

Weakness of 1 or more conjugate deviations: 4 percent

} 70 percent

* Third-cranial-nerve innervation.

monly in multiple sclerosis. He described an early finer oscillatory type, and a later coarse variety, both due to disturbance in the vestibulo-oculomotor paths.

Pupillary changes

Over 30 years ago Uhthoff wrote³ that pupillary anomalies are rare and not diagnostically important in disseminated sclerosis. With individual exceptions this opinion is still widely held. An Argyll Robertson pupillary reaction can occur, but is rare.⁹ Findings in our series are given in table 3.

Ocular palsies

Brain⁴ concludes that although diplopia occurs in 30-40 percent of cases, paresis of single muscles is not common, and of conjugate movements rare. On the contrary Parsons¹⁰ says that the pareses are usually of associated move-

Fundus changes

Changes visible with the ophthalmoscope in disseminated sclerosis are limited to the nerve head. The classical change is a temporal pallor or atrophy, stressed in importance and frequency by Uhthoff, and by most authors after him. Certain it is that temporal pallor positively diagnosed is of great significance, but the difficulty of distinguishing accurately between normal and abnormal temporal paleness of the optic disc robs this sign of much of its value.¹³ The same is true of mild blurring of the disc margins. Enthusiasm may breed error. In searching for confirmatory evidence for the diagnosis of multiple sclerosis, it is easy to see in a normally hazy disc an optic neuritis, and an optic atrophy in a normal relatively pale temporal half of a disc. We suspect that many ophthalmologists and neurologists have fallen into this error.

A sclerotic plaque in the optic nerve close behind the globe may produce a transient mild inflammation and edema of the nerve head in the fundus, followed later by atrophy. Lesions more posterior in the nerve cause no fundus change until atrophy ensues. Thus the most frequent alteration seen with the ophthalmoscope is atrophy of the nerve, though in early cases a mild optic neuritis may be found, and even papilledema has been reported.

H. Cohen¹⁴ claims that temporal pallor will be found in most cases if routine examination is done, and that neuritis is more frequent than texts would indicate. Klingmann⁷ claims that nine of his 12 cases showed atrophy of the inferior temporal quadrant, corresponding to the papillomacular bundle. This is the type most frequent in multiple sclerosis, but such high frequency is not found in the average series. Those compiled by Brain⁴ showed pallor of the disc ranging from 32.6 to 57.6 percent. The amount of pallor is not always related to the visual acuity. Uhthoff in 1889 found that the entire nerve may be diseased behind the globe, despite a normally appearing fundus.¹⁵

Only 20 percent of our series showed

ophthalmoscopically some type of optic atrophy in one or both eyes. An additional 4 percent showed blurring of the disc or definite neuritis, but no case of papilledema was seen. Types of atrophy are shown in table 4. All observers have found that seldom in multiple sclerosis is there a permanent complete atrophy, or a permanent severe blindness, especially in both eyes of the same individual. Pallor of the disc may persist but vision recover completely.

Retrobulbar neuritis

Uhthoff, who was one of the first thorough students of ocular signs in multiple sclerosis, claimed that 95 percent of all retrobulbar neuritis is caused by multiple sclerosis. Other estimates range down to 28 percent.¹⁶ It is of interest that in our series this diagnosis was made in only four patients. Since the central scotoma indicating retrobulbar neuritis is usually relative in multiple sclerosis (though absolute in ordinary retrobulbar neuritis¹⁰), it may be that search for this defect was not careful enough in our series. The scotoma is easily overlooked.

Since the papillomacular fibers, of all the optic nerve, are most sensitive to disease and toxin, they often are the first affected by the degeneration plaque of multiple sclerosis. The resulting central scotoma is misleading unless the physician always has such a diagnosis in mind. Technically, of course, the disease is a plaque of degeneration, and therefore cannot be properly called a neuritis. The prognosis again is good for vision. The nerve sheaths degenerate, glial proliferation follows, but the axis cylinders are usually not permanently affected; hence the scotoma and reduced vision disappear in a few weeks. Acute retrobulbar neuritis may be the first manifestation of multiple sclerosis (11 percent).⁴ We have seen this recently in a young woman. Adie is especially urgent in claiming that most or all acute unilateral retrobulbar neuritis is due to multiple sclerosis. Brain advises logically that every case for which no cause for the neuritis can be found, should be studied for multiple sclerosis.

Table 4

FUNDUS AND FIELD CHANGES IN 100 CASES OF
MULTIPLE SCLEROSIS

Optic Disc	O.D.	O.S.
Normal	77	83
Only papillomacular-bundle atrophy	1	0
Only temporal pallor or atrophy	10	7
Partial primary atrophy	4	3
Complete primary atrophy	1	0
Partial secondary atrophy	3	4
Blurring or neuritis	4	3

Field Changes
(Only 53 tested)

	O.D.	O.S.
Normal	39	38
Only central scotoma	5	0
Only paracentral scotoma	1	8
Only peripheral defect	4	4
Paracentral scotoma plus a peripheral defect	2	1
Tubular or fatigue field	2	2
Diagnosis of retrobulbar neuritis	3	1
Field pathology present in 20 percent of patients.		

Hemianopsia and quick changes in one patient.

Visual-field changes

Since the lesion may lie anywhere in the visual pathway, changes in the visual fields are frequent. Characteristic is their variability. They may be of any shape, size, location, and intensity, and may show rapid, bewildering changes in any of those respects. The defects appear, wander, disappear, and reappear, corresponding to the course of the disease plaque. A central scotoma is frequent, as noted above. Paracentral relative scotomata, usually small and difficult to discover, are frequent, according to Klingmann. Irregular peripheral defects are relatively common. Regular peripheral constriction must be differentiated from tubular fields, which, with fatigue fields, are found not infrequently. Fundus changes and field defects show little interrelationship. According to Cohen, the earliest field change is a relative scotoma for color.

Visual acuity and visual-field changes are of more importance in diagnosing and following the course of the disease than the appearance of the fundus. Transient defects and evidence of more than one lesion are highly suggestive of multiple sclerosis. Field changes showing steady progress are not characteristic of the disease. Dyschromatopsia is rather frequent.

Field changes in our series of 100 patients are listed in table 4. Only 53 percent had field determinations. Twenty percent of the patients showed field defects. For the most part these field determinations were routine tests. It is possible that with special care and attention, more cases of relative scotomata could have been found.

Especially in connection with the case about to be reported, the occurrence of hemianopsia in multiple sclerosis is of interest and importance. Contrary to the American Encyclopedia of Ophthalmology,¹⁷ which claims that it never occurs, most authors agree that it can and does occur, though perhaps less frequently than might be expected. Lloyd¹⁸ feels that more recent finer diagnostic methods have revealed relative hemianopsia that was previously overlooked. Traquair,¹⁹ whose excellent work gives the most complete review

of field changes in the disease, points out that lesions may "affect the tracts in the same way as the optic nerves or chiasm. . . . Homonymous hemianopic defects, varying in extent from a small hemianopic central scotoma to the loss of a quadrant or half the field, occur, and central vision is involved. . . . Apart from their hemianopic character these field changes do not differ in onset or course from those of multiple sclerosis affecting other parts of the visual path."

As an example of hemianopsia in multiple sclerosis, of rapidly changing field defects, of diagnosis based positively on field changes alone and otherwise only on exclusion, we wish to offer the following case report, one in the series of 100 patients.

Report of case

Mrs. E. H. aged 30 years, an ex-nurse and a physician's wife, was referred to the University Hospital by her local physician. One month before, the patient had noted a shadow or blind area in the temporal field of the right eye, moving with eye movements. It had not changed subjectively since its onset. There had been no symptoms in the left eye, nor ocular pain. After two weeks she visited her oculist, who found in the visual fields a right temporal defect that had since enlarged slightly, and a small left temporal scotoma.

The patient had bruised easily all her life. For many years she had had a tenderness and at times a small tumor mass low in the right abdomen which, despite extensive study, had never been diagnosed. These abdominal symptoms were not related to meals, defecation, or to her purpuric spots. Exploratory operation of the abdomen several years ago had revealed no pathology, and a normal appendix had been removed. For three years, starting eight years before, while a nurse at a leading clinic, she had a repeated leukocytosis. For two or three years the patient had been treated for pyelitis and cystitis, with hematuria one year before this examination, the urine then showing *B. coli*. There was a history of recurrent upper respiratory infections and influenza over the past 10 years, each attack associated with urinary symptoms. During pregnancy a year and a half before this visit, she had had hyperemesis and pyelitis. Fourteen weeks before this admission she had a perineal lesion, resembling abscess, lasting 10 days, and six weeks later a recurrence, lasting a few days. The discharge was purulent but odorless, and could not be explained by her gynecologist. One week before onset of the present illness there had been a localized pain on the left frontal and supraorbital region; it was transient, lasting from a few

Fig. 1

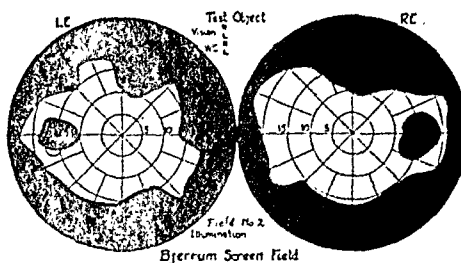
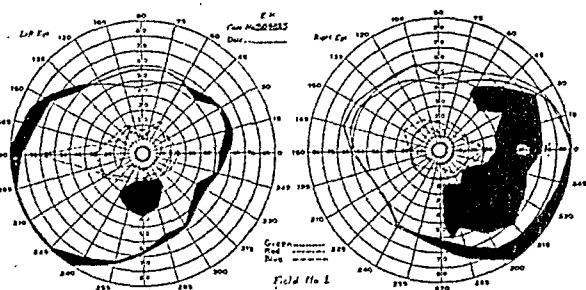


Fig. 2

Fig. 3

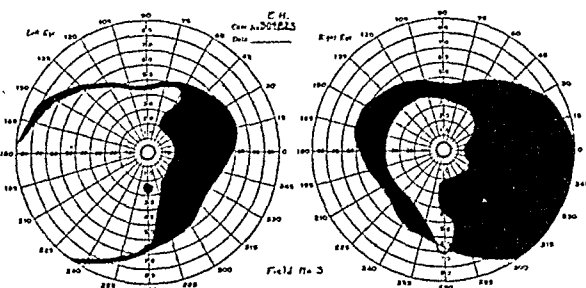


Fig. 4

Fig. 5-6

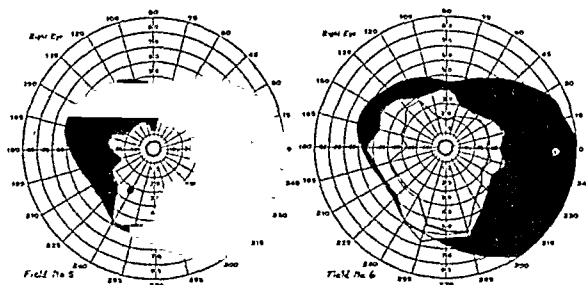


Fig. 7

Fig. 8

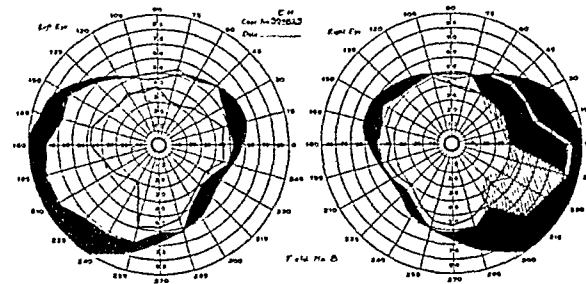


Fig. 9

Fig. 10

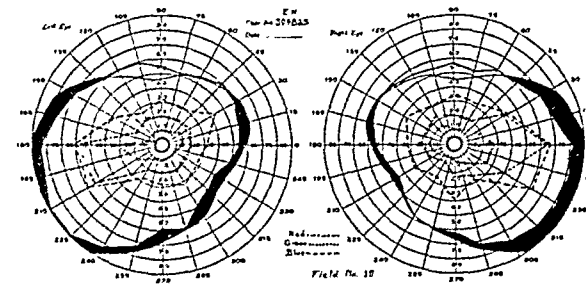
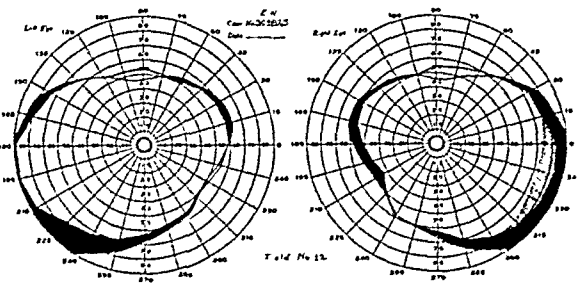


Fig. 11

Fig. 12



minutes to an hour, occurring once daily for one week.

Uncorrected visual acuity was O.D. 6/6 -2, and O.S. 6/6 +1. The eyes were straight and extraocular movements normal. There was no nystagmus, and no external pathology. Pupils were round and equal, with normal reactions to light, consensually, and in accommodation. Tactile tension was normal. Pupils dilated widely and evenly after instillation of a mydriatic. The fundi were entirely normal, the discs of normal color throughout. The physiologic cup was deep and the lamina cribrosa plain. Pigment rings were distinct. Maculae, vessels, and periphery showed no abnormality.

The visual fields were carefully determined, and were considered to be very accurate because of the unusual coöperation and intelligence of the patient. On the perimeter (fig. 1) with 5-mm. test objects in O.D. a very large temporal scotoma was found with a small island of vision in it on the horizontal meridian. Color fields were moderately contracted. The left eye showed a moderately large scotoma to a 1-mm. object below, lying in the midline, and there was interlacing of blue and red in the tem-

poral field. Central fields on the Bjerrum screen with 1-mm. white object (fig. 2) showed slightly enlarged blind spots.

A neurological examination on the same day showed no abnormality. The cranial nerves functioned normally. No abnormal reflexes were noted.

Medical examination showed that the cecum was palpable, and its palpation caused pain such as the patient had previously noted. Otherwise the general medical clinical examination was negative. Blood studies showed: Leukocytes 12,600; red-blood-cell count 4,070,000; hemoglobin 75 percent (Sahli); differential leukocyte count: Polymorphonuclears 67 percent, basophiles 1 percent, eosinophiles 2 percent, lymphocytes 23 percent, monocytes 7 percent. Venous blood in 6-mm. test tubes coagulated in from 7 to 10 minutes, or a normal range for this method. Normal firm clots were retracting 12 hours later. Bleeding time by Duke's ear-puncture method was 2½ minutes, or normal. Medical consultant believed these findings essentially normal, and that the purpura mentioned in history might well be nothing more than the easy bruising which occurs sometimes in women, or possi-

Fig. 1 (Marshall and Laird). Perimetric fields on first examination. Vision: O. D. 6/6 -2; O.S. 6/6 +1, uncorrected. Test objects: 5 mm. round white, and colored as noted. Scotoma O.S.: 1 mm. white. Distance: 250 mm. Illumination: 10 foot-candles.

Fig. 2 (Marshall and Laird). Central fields on tangent screen on first examination. Test object: 1 mm. round white at 1000 mm. Illumination: About 7 foot-candles.

Fig. 3 (Marshall and Laird). Perimetric fields by local oculist 12 days after first examination. Test object: 2 mm. white at 250 mm.

Fig. 4 (Marshall and Laird). Perimetric fields two weeks after first examination. Vision: O.D. 6/9 +3; O.S. 6/9, uncorrected. Test object: 5 mm. at 250 mm. Illumination: 10 foot-candles.

Fig. 5 (Marshall and Laird). Perimetric field right eye two weeks after first examination using a 1-mm. test object at 250 mm.

Fig. 6 (Marshall and Laird). Perimetric field right eye three weeks after first examination. Vision: 6/5 -2. Test objects: Outer boundary 5 mm. white at 250 mm.; Inner line 1 mm. white at 250 mm. (Patient too dizzy to determine field for left eye.)

Fig. 7 (Marshall and Laird). Perimetric fields five weeks after first examination. Vision: O.D. 6/6 +2; O.S. 6/6 -2, uncorrected. Colors: 5-mm. test objects at 250 mm. Scotoma O.S.: 1 mm. white at 250 mm.

Fig. 8 (Marshall and Laird). Perimetric fields five weeks after first examination. Outer boundary 5 mm. white at 250 mm. Inner boundary 1 mm. white at 250 mm.

Fig. 9 (Marshall and Laird). Perimetric fields nearly two months after first examination. Vision: O.D. 6/5 -2; O.S. 6/6 +3, uncorrected. Test objects: Inner solid line 1 mm. form at 250 mm. Remainder 5 mm. at 250 mm.

Fig. 10 (Marshall and Laird). Perimetric fields four months after first examination. Vision: O.D. 5/5; O.S. 5/5 -2, uncorrected. Test objects: 5 mm. white and colored at 250 mm.

Fig. 11 (Marshall and Laird). Perimetric fields four months after first examination using 1 mm. white at 250 mm.

Fig. 12 (Marshall and Laird). Perimetric fields by local oculist five months after first examination and six months after onset of symptoms. Test object: 2 mm. white at 250 mm.

bly a symptomatic purpura on a toxic basis. Further investigation of possible toxic foci was advised.

X-ray films of the skull showed very slight rarefaction of the posterior clinoids, more on the right than left, but within normal variation. Neurosurgical consultant felt there was no definite evidence of any sort of pituitary lesion.

On the basis of the field changes, and otherwise negative evidence of neurological disease or intracranial lesion, a tentative diagnosis of disseminated sclerosis was made. A toxic neurological lesion was considered possible, and to be ruled out, the most likely source being kidney or bladder.

The patient returned home, but was readmitted to the hospital two weeks later for further studies. There had been no subjective change. The fundi were entirely normal. Uncorrected visual acuity was O.D. 6/9 + 3, and O.S. 6/9, a definite decrease in two weeks. Ocular examination otherwise was negative as before except for visual fields. Fields taken by her local oculist two days before had shown a definite right homonymous defect (fig. 3). They now showed the same (fig. 4). Except for two small peripheral islands of vision, the entire lateral portion of the right field was gone to a 5-mm. white object at 250 mm., but with a very irregular mesial boundary. Above and nasally there was very definite constriction. To a 1-mm. object the temporal and superior defect was greater (fig. 5). The left eye showed nasally a large relative scotoma to a 5-mm. object, similar to that noted previously on the temporal side of the field in the right eye (fig. 1). This scotoma now present in the left eye definitely crossed the midline below. These fields showed great progress of the defects present 18 days before.

The patient was feeling well, without headaches or nausea. Extraocular movements remained normal and without nystagmus. There was no palsy of the face, tongue, or extremities, and no tremor. Biceps and triceps reflexes were normal, knee and Achilles reflexes slightly increased. Sense of vibration, motion, position and deep pain was normal in the legs. Spinal-fluid pressure was 40 mm., the fluid being clear and normal, except for two cells per cu. mm., and a Gold Sol curve of 0011000000. Kahn tests on blood and spinal fluid were each negative. Neurological examination showed in brief no significant pathology.

The Department of Urology found only a few bacilli in a catheterized urine specimen, and 5 to 10 white blood cells per high-power field, concluding that in view of negative pyelographic studies made one year before, the urinary tract was not to be regarded as a causative factor in the patient's complaint.

Five days after this admission kidney-concentration studies were made by Dr. Floyd H. Lashmet, using his own method. These were practically normal. His impression was that the patient had had a chronic strepto-

coccic infection with mild renal involvement and recurrent exacerbations.

Chest X-ray films showed no gross pulmonary pathology. Gynecologic examination showed no pathology except tenderness in both lower quadrants, and many gram-positive bacilli and cocci in the vaginal smear; potassium permanganate douches were advised. It was not felt that the pelvis was a focus of infection. Nearly two months after onset of symptoms the Department of Neurology still could find no signs of diagnostic significance, and suggested disseminated sclerosis as the etiologic factor. Clinical examination of the nose, throat, ears and sinuses was negative.

Following lumbar tap the patient was dizzy for at least a week, for, one week later, she was too ill to have a check made of visual fields in both eyes. That in the right eye showed little change (fig. 6). She was discharged to go home the next day, with a diagnosis of disseminated sclerosis based on field changes and by exclusion. Her husband was instructed to give her iron, quinine, and strychnine tonic, and Fowler's solution.

She returned in 10 days, having used Fowler's solution up to 30 min. a day, and the tonic noted. She felt better. Vision O.D. was 6/6 + 2, O.S. 6/6 - 2. Fundi were normal. Visual fields showed considerable improvement, but with a new scotoma in the temporal field O.S. (figs. 7 and 8).

Eighteen days later, or nearly three months after onset of ocular symptoms, the patient had no constitutional complaints, and a marked subjective improvement in vision. Uncorrected visual acuity was in the right eye 6/5 - 2, and in the left 6/6 + 3. The fundi were still normal in all respects. Neurological examination was negative. Visual fields (fig. 9) were normal. The iron tonic and Fowler's solution were stopped.

Nearly four months after her first admission visual acuity uncorrected O.D. was 5/5, and O.S. 5/5 - 2. The patient felt better than she had for some time. Fields were normal for a 5-mm. object, but with a 1-mm. object at 250 mm. the temporal defect O.D. was still recognizable (figs. 10 and 11). Fields taken by the home physician five weeks later, or six months after the onset of symptoms, were normal except for a slight relative defect or contraction of the temporal field in the right eye (fig. 12).

Now, four years later, the patient reports that she has had no further trouble, and no ocular complaints, except during a pregnancy which had to be therapeutically interrupted. Unfortunately no oculist saw her during that period.

Summary

A review of history and ocular findings in 100 consecutive cases of multiple sclerosis is presented. In general the frequency of ocular pathology corresponds closely with statistics reported

by previous writers. In addition a case of hemianopsia is reported in which diagnosis of multiple sclerosis was based entirely on field changes. The article aims to remind ophthalmologists and neurologists of the important and frequent part the eye plays in the diagnosis of the disease.

Bibliography

- ¹ Adie, W. J. Etiology and symptomatology of disseminated sclerosis. *Brit. Med. Jour.*, 1932, v. 2, Dec. 3, pp. 997-1000.
- ² Birley, J. L., and Dudgeon, L. S. A clinical and experimental contribution to the pathogenesis of disseminated sclerosis. *Brain*, 1921, v. 44, July, p. 150.
- ³ Uhtoff, W. The significance of the eye symptoms in disseminated sclerosis of the brain and spinal cord. *Ophthalmoscope*, 1905, v. 3, Sept. 1, pp. 429-436.
- ⁴ Brain, W. R. Disseminated sclerosis—A critical review. *Quarterly Jour. Med.*, 1930, v. 91, April, pp. 343-391.
- ⁵ Association for Research in Nervous and Mental Diseases. Multiple sclerosis. New York, Paul B. Hoeber, 1922, p. 126.
- ⁶ Oppenheim, H. Textbook of nervous diseases. Transl. of 5th German Ed. of 1908, New York, G. E. Stechert & Co., 1911, pp. 332-350.
- ⁷ Klingmann, T. Visual disturbances in multiple sclerosis. *Jour. Nerv. and Ment. Dis.*, 1910, v. 37, pp. 734-748.
- ⁸ Williamson-Noble, F. A. Eye signs in nervous diseases. *Clin. Jour.*, 1933, v. 62, Dec., pp. 483-491.
- ⁹ Abramson, J. L., and Teitelbaum, M. H. The Argyll Robertson phenomenon in multiple sclerosis. *Amer. Jour. Ophth.*, 1933, v. 16, Aug., pp. 676-682.
- ¹⁰ Parsons, J. H. Diseases of the eye. Ed. 6, New York, Macmillan, 1931, pp. 560-561.
- ¹¹ Sachs, B. See 5 above, pp. 50-51.
- ¹² Quoted in 4 above.
- ¹³ Holden, W. A. See 5 above, pp. 102-108.
- ¹⁴ Cohen, H. The early diagnosis of tabes dorsalis and disseminated sclerosis. *Clin. Jour.*, 1933, v. 62, Aug., pp. 314-318.
- ¹⁵ Taylor, E. W. See 5 above, p. 184.
- ¹⁶ Shield, J. A. Disseminated sclerosis. *Southern Med. Jour.*, 1932, v. 25, Nov., pp. 1116-1121.
- ¹⁷ The American Encyclopedia and Dictionary of Ophthalmology. Wood, C. A., Chicago, Cleveland Press, 1915, v. 6, pp. 4041-4044.
- ¹⁸ Lloyd, R. I. Visual field studies. New York, Technical Press, 1926, pp. 167-170.
- ¹⁹ Traquair, H. M. An introduction to clinical perimetry. St. Louis, C. V. Mosby Co., 1927, p. 206.

GLAUCOMA IN AMBLYOPIA

SAMUEL V. ABRAHAM, M.D.
LOS ANGELES, CALIFORNIA

A normal working gland or muscle requires and usually receives more blood than a similar organ that is not working. In cases of subnormally functioning organs the blood supply is physiologically decreased. Such organs cannot call upon the same extensive vascular response that is obtained by normal tissue. This is shown by the lessened response of amblyopic eyes to anterior-chamber puncture. The author believes, therefore, that primary glaucoma should be relatively infrequent in such eyes. A search of the literature supports this opinion, for no definite case of chronic primary glaucoma in an amblyopic eye was found, and only one case of acute glaucoma in such an eye. It is assumed, in explaining the infrequency, that a critically important increased inflow of fluids is less likely to occur in such amblyopic eyes. Because the vascular crisis is greater in the acute than in the chronic form, the former is considered the more likely to occur. A case of acute glaucoma in amblyopia is here recorded.

The physiologic principle emphasized by the author in a criticism of a proposed test for glaucoma¹ was that a working organ (gland or muscle) requires and usually receives more blood. In cases of subnormally functioning organs, the blood supply decreases by physiologic means. Such organs cannot call upon the same extensive vascular response that is obtained by normal organs. In the article to which reference has been made, attention was called to the lowered response of amblyopic eyes to anterior-chamber puncture as compared to that of normal eyes.

The response to puncture of atropinized eyes was also indicated to be subnormal. The data furnished by Adler and Landis² on the protein content of the aqueous tend to support the author's opinion concerning the vascular response of physiologically normal and subnormal organs.

L. Bothman³ recently called the writer's attention to the relative rarity of senile cataract in amblyopic eyes. This may possibly be explained by the reduction of activity on the part of the ciliary body with a decrease in exposure of the lens to noxious substances in the blood.

The literature reveals no reference to the incidence of chronic primary glaucoma in an amblyopic eye. It is possible that such cases have been seen but that the relationship to the problem of glaucoma was not considered important. The writer believes that cases of chronic primary glaucoma in amblyopia are considerably less frequent than the incidence of amblyopia would justify, and that such cases have not been re-

ported because they have rarely been observed.

While acute glaucomatous attacks have been described with relative frequency, reference to such attacks in an amblyopic eye has been found but once. This was in the report of a case of mydriatic glaucoma by H. Gifford⁴ in 1916. The acute glaucoma occurred in a female aged 69 years. The right vision was 20/20. The left eye, slightly convergent and amblyopic since childhood, had 20/70 vision. There were slight lenticular and vitreous opacities in each eye. One drop of 4-percent homatropine was instilled into the conjunctival sac of each eye for the purpose of dilating the pupils for facilitating study of the fundi. Eserine was instilled later into the right eye but nothing was used in the left eye (through oversight). An attack of acute glaucoma in the left amblyopic eye occurred that evening.

It is desired here to report a case of acute glaucoma in an eye undoubtedly amblyopic following early convergent strabismus.

Case Report

E. Y., a female, aged 55 years, was first seen in July, 1933. There was a history of pain and decreased left vision of four weeks' duration. The pain was especially marked in the mornings.

The past history revealed no trouble in the right eye since childhood. There had been a right convergent strabismus since early infancy following what may have been a gonorrheal ophthalmia. The right vision had always been poor. When the first pair of glasses was pre-

scribed the patient was 23 years old, and she had been told that no glass would help the right vision. The left eye had had vague visual disturbances periodically during the past year. The condition had become much worse during the last four weeks while on her return from Europe to see her only child whom she had not seen in 10 years.

Examination revealed a typical case of acute glaucoma in the left eye, with an intraocular tension of 60 mm. (Schiötz), and vision reduced to the ability to count fingers at nine feet. The right eye converged 10 degrees, but except for a diffuse superficial central corneal opacity was without pathology. Tension in this eye was 12 mm. (Schiötz) and vision the ability to count fingers at seven feet.

A total iridectomy combined with an Elliot trephining operation was done within 24 hours, as medical care gave no relief. Within 48 hours after operation on the left eye, the right eye (previously never involved), developed an acute glaucoma, despite prophylactic use of eserine at four-hour intervals. More frequent use of miotics controlled the tension. On the morning of the third day after the operation the right eye again showed an increased tension which responded to more frequent use of miotics. The patient was discharged from the hospital on the seventh day after operation. Atropine was continued for the left (operated-on) eye and miotics were prescribed for use in the right eye. Eight days later the patient returned with an acute glaucomatous attack in the right eye. Vision in the left eye with $+1.75$ D. sph. $\approx +0.50$ D. cyl. ax. $90^\circ = 0.3$ and left tactile tension was normal. The pain in the right eye was severe and did not respond to medical treatment. This right tension at the time of operation (after considerable medication) was 45 mm. (Schiötz). An operation similar to that on the left eye was performed. Atropine was used in both eyes for four weeks. During this time an objective refraction was done. Vision in the right eye with -4.00 D. sph. ≈ -1.25 D. cyl. ax. 90° was finger counting at six feet; in the left eye

with $+1.50$ D. sph. $\approx +1.75$ D. cyl. ax. 180° it was $0.4+1$. The right disc was at all times normal. The right visual fields for 1 degree red and white showed a mild (10 degree) concentric contraction of the peripheral field. A relative central

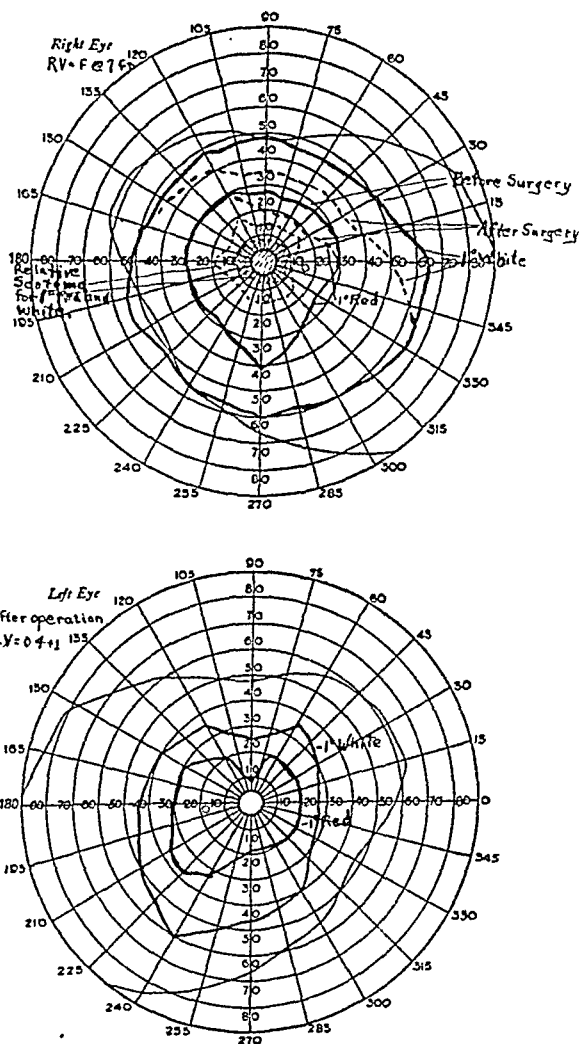


Fig. 1 (Abraham). Upper chart (right eye) shows the field before surgery (solid line) and after surgery (broken line). The lower chart (left eye) shows the field after the operation, when vision was $0.4+1$.

scotoma was present. This was explained on the basis of the amblyopia with stabismus. The left disc showed a definite though incomplete cupping involving three fourths of the disc. The vessels were displaced nasally.

This case of acute glaucoma in an amblyopic eye is being placed on record not only to show that this can occur,

but to stimulate a search for such cases.

Acute glaucoma in which the inciting factors are more effective may more readily be expected to induce an attack in amblyopic eyes than the less severe chronic form of glaucoma.

The idea that primary glaucoma is initially due to a vascular crisis in which there is an excessive fluid inflow into the eyeball is given additional support by the case reported. Studies on the appearance of obstruction to outflow (Troncoso,⁵ Werner⁶) suggest that the reaction in the iris angle follows the initial vascular disturbance and makes more permanent the imbalance between inflow and outflow of ocular fluids. That any condition of the eye which tends to prevent an increased blood flow to the eyes is to be considered a probable factor in the reduction of the incidence of primary glaucoma is self-evident. One would expect to find a lowered frequency of glaucoma in myopia. The literature on this contains conflicting reports (Gilbert,⁷ Gala⁸). One of the latest reports (Gala⁸) on this subject, and one which apparently contains the largest series of glaucoma cases investigated for this purpose, showed that before operation there were only seven myopic patients in 438 cases of primary glaucoma or only 1.6 percent. The incidence of myopia in the age group con-

cerned is considerably higher, over 15 percent (Tassman⁹). In a study of intraocular tension in anisometropia, Urio¹⁰ found the tension to be lower in the higher myopias. According to Gala⁸ the reverse is true in hyperopia, indicating, as Ferree and Rand¹¹ have also emphasized, that any condition tending to cause an increased blood flow to the eyes should be considered a probable contributory factor in the production of increased tension.

If data were available on the frequency of glaucoma in *uncorrected* myopia, the reports would probably show more clearly the influence of the factor of a normally or a subnormally functioning organ, particularly an active or inactive ciliary body.

Conclusions

1. A case of acute glaucoma in an amblyopic eye is presented.
2. It is suggested that subnormally functioning eyes tend to be less susceptible to primary glaucoma. This seems to be true for amblyopic eyes.
3. Relief from "eye strain," especially as it occurs in hyperopia, is particularly desirable in glaucomatous patients.
4. The relation of a disturbed inflow to the etiology of glaucoma is emphasized.

901 Roosevelt Building.

Bibliography

- ¹ Abraham, S. V. Anterior chamber punctures, etc. Arch. of Ophth., 1932, v. 7, June, p. 888.
- ² Adler, F. H., and Landis, E. M. Studies on the protein content of the aqueous. Arch. of Ophth., 1925, v. 54, May, p. 265.
- ³ Bothman, L. Personal communication on unpublished data.
- ⁴ Gifford, H. Jour. Amer. Med. Assoc., 1916, v. 67, July 8, p. 112.
- ⁵ Troncoso, M. U. Closure of the angle of the anterior chamber in glaucoma. Arch. of Ophth., 1935, v. 14, Oct., p. 557.
- ⁶ Werner, S. Gonioscopy in primary glaucoma. Arch. of Ophth., 1932, v. 10, p. 112.
- ⁷ Gilbert. Glaucoma in myopia. Arch. f. Ophth., 1912, v. 82, p. 391.
- ⁸ Gala, A. Myopia and glaucoma. Oft. Sbornik, 1930, v. 5, p. 119; Amer. Jour. Ophth., 1931, v. 14, p. 385.
- ⁹ Tassman. Frequency of refractive errors, etc. Amer. Jour. Ophth., 1932, v. 15, Nov., p. 1044.
- ¹⁰ Urio, H. Myopic fundus degeneration in anisometropia, etc. Arch. of Ophth., 1933, v. 131, Dec., p. 377.
- ¹¹ Ferree, C. E. and Rand, G. Lighting and the hygiene of the eye. Arch. of Ophth., 1929, v. 2, July, p. 24.

THE ROLE OF PARACENTESIS IN OPHTHALMOLOGY

WILLIAM F. HARDY, M.D.
SAINT LOUIS

Paracentesis receives but scant notice in ophthalmic literature. The operation itself is simple and minor, but the conditions in which it is used are serious and major. The role of the aqueous is briefly discussed. Conditions in which paracenteses are occasionally used to advantage are mentioned. Reference is made to bullous formations. A case is reported in which bullae and relapsing erosion of the cornea occurred following trauma and which was apparently brought to an end by repeated paracenteses. A proper evaluation of the therapeutic measures employed is difficult because so many were tried. In view of the recent work of A. L. Brown, the combination of parenteral injections of typhoid-para-typhoid and paracenteses may be deserving of the credit. Read before the St. Louis Ophthalmic Society, January 24, 1936.

Medical literature both general and special contains many references to rare and unusual conditions and to methods of procedure or operation which find little practical use in every day practice. This is true of ophthalmology as well as of the other specialties. It is surprising to find that minor procedures or operations may be virtually ignored in medical reports. Possibly because they are minor, one hesitates to clutter up further an already overburdened bibliography. Paracentesis falls into this category. A search of the literature going back many years revealed but few and meager references. It is only the textbooks that have anything to say about this minor yet important operation.

The term is used in the broader sense to include both puncture of the anterior chamber and of the vitreous chamber. Though the operation itself is simple and minor, the conditions in which it is used are serious and major, such, for instance, as in embolus of the central artery and in secondary glaucoma.

Puncture of the cornea was introduced by McKenzie as a means of combating the increase of tension in glaucoma, but it was soon found to be of but temporary benefit and gave way completely to iridectomy as a curative measure. However, paracentesis has its place in glaucoma, when a transient effect only is desired simply to tide over a bad situation. It is then usually known by the more dignified terms of anterior or posterior sclerotomy. Sclerotomies in their essence are but amplified paracenteses.

It might be well, before detailing the

conditions for which paracentesis may be employed with benefit, to give some consideration to the aqueous. In the normal eye the aqueous is formed by the epithelium of the ciliary processes by a process of selective filtration or transudation and is not a secretion in the true sense. It is a limpid, clear, watery fluid containing but a minimum of salt and albuminous matter. If any tissue depends on the aqueous for its nutrition, it must have a precarious existence. The total amount of aqueous is small and its rate of flow slow. The time consumed in a complete change of fluid in the anterior chamber requires about 45 minutes to an hour in the normal eye. As soon as the anterior chamber is artificially evacuated, the character of the aqueous changes and it then becomes so charged with albuminous matter that it may spontaneously coagulate, a thing which normal aqueous can never do. The salt content and the amount of antibodies also increase. This change in the nature of the aqueous may be decidedly advantageous in some instances and doubtfully so in others.

It is a matter of common clinical observation that when a corneal ulcer spontaneously perforates, the eye begins to recover. Why is this? A number of factors may be operative. The change for the better in the ulcer is so rapid and marked that it is not difficult to believe that a neutralizing element, namely, an antitoxin, has been at work. Perhaps the improvement is due to the temporary release of normal tension on the corneal lamellae, since the intraocular tension is for a while reduced to

zero. Or is the improvement the result of the ulcer's being bathed by a new and different aqueous, rich in salts, protein, and antibodies? All these conditions may play a part in healing but special consideration must be given the role of the altered aqueous. Chemical and bacterial irritants may change the character of the aqueous, as happens in the well-known reaction of the ciliary body to a foul corneal ulcer. Toxins from such an ulcer pass by osmosis into the eye and set up an irritation with a resulting engorgement of the ciliary vessels and the exudation of leucocytes.

When the anterior chamber is artificially or spontaneously emptied the turgescence of the ciliary vessels is very great, allowing the nutrient and bactericidal elements of the blood to pass the heretofore discriminating ciliary epithelium and enter into the formation of a much-altered aqueous. The release of tension on the corneal lamellae may have much to do in enabling the cornea to imbibe a greatly increased amount of nutrient lymph. On the other hand, increased tension would tend to consolidate the corneal lamellae and result in a restricted flow of interlamellar lymph. All are familiar with the leather-like toughness of the sclerocornea in chronic glaucomatous eyes. It is in these chronic-hypertension cases that nutritional disturbances are commonly encountered.

The cornea, being an avascular structure, depends for its nutrition in great part on the passage of lymph between its lamellae. This lymph originates from the vascular loops at the limbus. The diffusion of lymph plus the exudation of leucocytes occurs physiologically in the normal healing of corneal infections at an accelerated rate, but it is not fast nor complete enough to prevent widespread destruction of corneal tissue if the infection is virulent. The relaxation of the tension on the corneal lamellae, the result of a paracentesis or any incision of the cornea, would cause an engorgement of these limbal vascular loops and also mechanically make for a freer passage of nutrient lymph and hence a stimulus to repair. If spontaneous rupture is beneficial

then, so far as repair is concerned, but detrimental as regards complications and sequelae such as prolapsed iris or cystoid scar, why not employ paracentesis in threatened rupture? This thought occurred to ophthalmologists many years ago, giving us the ordinary limbal puncture, and also the well-known Saemisch section. The limbal puncture was formerly performed much more frequently than at present, both for all types of threatening perforation and for many other unrelated conditions. The worst type of ulcer seems to have been reserved for the Saemisch section. Inasmuch as the section is made through the floor of the ulcer, the eye is exposed to the danger of iris prolapse and injury to the lens. A limbal incision while it does not cause so much nor so prolonged a relaxation of the corneal lamellae and does not allow the ulcer floor to be bathed by the leaking aqueous, yet obviates the dangers just related. One can always repeat a paracentesis. The reason one hesitates to do a paracentesis in an infected-ulcer case is the hazard of intraocular infection. The dangers inherent in a spontaneous rupture would appear to outweigh this hazard. The operation of delimiting keratotomy is but a modification and elaboration of paracentesis and the Saemisch section. The cut in delimiting keratotomy is made in sound tissue adjacent and tangential to the advancing border of the ulcer.

In addition to its application in cases of ulcer, paracentesis has been used as a therapeutic measure in a number of other conditions. Except in secondary glaucoma the occasion for its use does not frequently arise. The conditions may be enumerated as follows:

Embolus. In embolus of the central artery it may be tried if the case is seen early. Theoretically it should help. With the tension reduced to zero in front of the the embolus, the vis-à-tergo in the vessel might push it along to a branch of the artery. Unfortunately, many cases of so-called embolus are in reality instances of thrombosis. If used, something might be gained; nothing is lost if it does not work. In such a desperate condition anything that

offers any promise should be used.

Detachment of the retina. Puncture of the sclera, single or multiple, was used many years ago for detachment of the retina with a view to evacuating the subretinal fluid. The idea of producing a localized plastic chorioretinitis does not seem to have been a part of the procedure, as it is in our more recent operations.

Glaucoma. Paracentesis was originally used to reduce tension, but produced no lasting results, acting only as a palliative measure. Such effects are useful to a greater extent in secondary glaucoma. For permanent results paracentesis was superseded by iridectomy and types of filtering cicatrices. Increased tension at times accompanies iritis and other uveal inflammations; if uncontrolled by medicinal measures, paracentesis may be performed. Long-standing iritis that has yielded to nothing may necessitate the minor operation of paracentesis or the major one of iridectomy. The relief of symptoms from a swollen lens comes really under the heading of secondary glaucoma. Posterior scleral puncture is used to deepen the anterior chamber to make possible an iridectomy and also to lower the tension in an eye with very high tension in order to obviate the danger of an expulsive hemorrhage.

Keratectasia. In the beginning of this condition it may be combated with paracentesis and a pressure bandage. Keratectasia may follow pannus, parenchymatous keratitis, and ulcer. It is frequently accompanied or followed by increased tension. In all of these conditions paracentesis may find a place.

It is probable that the use of paracentesis in helping to clear up vitreous opacities and in uveal inflammations with normal tension was based on the effect produced on tissue metamorphosis, but just how this comes about is not quite clear. That the operation has an influence on tissue metamorphosis is beyond cavil. It is this latter effect which I wish to discuss in some detail as it bears on the case report which is to follow.

As it is possible and usual for drugs and toxins to pass from the exterior

to the interior of the eye by osmosis, so likewise it may be possible for substances in solution to pass in the reverse direction. These may be noxious or nutrient. Nutritional or innervational disturbances bring about vesicular or bleb formation, the source of the fluid not being definitely known. The genesis of a number of the obscure keratitides may exist in a perversion of the aqueous, especially if accompanied by a disturbance of the endothelium of Descemet's membrane.

Irritants passing by osmosis or otherwise from the interior to the exterior might conceivably set up a disturbance in the anterior part of the cornea giving rise to superficial lesions. These might take the form of bleb formations with or without the loss of corneal epithelium. This is ventured purely as a hypothesis. The probable source of the fluid in ordinary vesicles and blebs is from the interlamellar lymph, the bleb formation coming about in some manner associated with trophic disturbance. Bleb formation may be summed up as dependent on two factors: namely, (1) abnormal conditions of lymph constitution or lymph circulation, and (2) some abnormality of innervation. It is thought by some that deficient nerve power is the cause of ulceration following vesicle formation and relapsing erosion of the cornea.

One of the functions of the endothelium of Descemet's membrane and of the corneal epithelium is that of waterproofing. Were this not the case the cornea would swell and cease to be clear because of the imbibition of water. In cases of bleb formation in eyes which have come to anatomical investigation (usually glaucomatous) it is a common, or, one may say, usual occurrence to find the endothelium altered. This being the case, weight is given to the hypothesis that noxious or other elements might enter the cornea from the anterior chamber and influence its nutrition, especially that part of it which is concerned with bleb formation; namely, the corneal epithelium and Bowman's membrane. It seems quite probable that a different explanation must exist for the formation of bullae

following glaucomatous and degenerative conditions and those cases in which no such history is present. It is only the former class of cases that come to anatomical investigation.

It is a case of formation of bullae accompanying a relapsing erosion of the cornea, the result of trauma, which I wish to report briefly. The case report is as notable for the measures that did not help as for those that did. Final credit was given to repeated paracenteses (6). Fuchs has stated that recurrences of vesicles and bullae can at times be stopped only by iridectomy. The lesser and nondeforming operation of paracentesis was tried. The explanation for the beneficial action of paracentesis was that tissue metamorphosis was in some way affected, possibly from a lowering of the intraocular tension and the removal of the stress on the corneal lamellae. There is a possibility also that a change in the nature of the aqueous had some bearing.

Case report

Mr. P. S., aged 43 years, was injured March 17, 1934, by being struck in the right eye with a piece of bread. He was treated for a week by his family physician with no improvement. The pain was very severe when he was seen on March 25, 1934. The edges of the abrasion were thickened and soggy looking. Treatment consisted of atropia, xeroform in oil, infrared light, and holocaine ointment, followed in succession by typhoid vaccine intravenously (4 injections). This seemed to help for a while, but on April 7 there was a relapse with denudation of a large area of the cornea. Atropine was stopped, as the eye felt hard, and 1-percent optochin substituted. Codeine and pyramidon were taken for pain. The lids were puffy. The tension was 28 mm. Hg on April 13th. The patient had some nasal polyps and their removal was advised. At home, pantocaine, 1 percent, had been used regularly, but was insufficient to keep down the pain. On April 18th, hyoscine, 0.25 percent, was used. A Wassermann test was ordered. On April 23d there was a large bleb

taking in the lower half of the cornea; a dependent sac filled with fluid. This was punctured and it flattened out. On April 25th, the epithelial layer all over the cornea was loose and was lifted off with forceps. There was a slight bleeding from the limbal loops. The cornea was dried and 15-percent trichloroacetic acid was applied over the whole denuded area. The patient did well following this until April 30th. Again the epithelium was removed and the cornea touched with 15-percent trichloroacetic acid. On May 1st the nasal polyps were removed. The next day a small denuded area was touched with 3½ percent tincture of iodine. On May 7th the epithelium was soggy and loose and was removed from the whole cornea, to which 3½-percent tincture of iodine was applied. The pain and reaction were most severe.

At the height of the trouble a number of exposures to ultraviolet light had been given with apparently no results. Chromium sulphate internally had been given at home.

On May 11th the first paracentesis was performed. This was followed by five other paracenteses, the last on May 28th. Following the first puncture the improvement in the ocular condition began. Atropine was continued as long as the eye was red and irritable. On June 29th the eye was white and quiet and had shown no staining since May 29th. The haziness of the cornea gradually disappeared and on August 24th the vision was 6/6—1 with —0.37 D. cyl. ax. 90°. From then until November 27th, a period of three months, a gradual change took place in the curvature of the cornea associated with a clearing of the opacity. The final refraction was: O.D. —1.00 D. sph. \approx +2.00 D. cyl. ax. 180°. With this correction vision was 6/6. The patient has been seen at intervals since that time but has had no return of symptoms and no further change in refraction.

To Dr. Mason I wish to acknowledge my appreciation for his suggestion of the use of 15-percent trichloroacetic acid and of paracentesis.

Note: Since the above was written

a paper was read at the Kansas City meeting of the American Medical Association (May, 1936) by Dr. Albert L. Brown of Cincinnati in which the results in corneal ulcer were reported. The treatment consisted essentially of parenteral injections of typhoid-paratyphoid combined with paracentesis. Of

decided interest was the statement that the effects of typhoid injections persisted for as long as 200 days. That the combined action of typhoid injections and paracentesis may have been the beneficent factor in the case just reported must be given consideration.
Humboldt Building.

UNILATERAL CONGENITAL ANOPHTHALMOS WITH ORBITOPALPEBRAL CYST

MORRIS ROSENBAUM
NEW YORK

The author asserts that eye defects, while they may be due to vitamin deficiencies, may also be caused by transmission from one generation to another as a result of deficiency in the chromosomes. These deficiencies bring about inhibition of embryonic growth during early development. Read before the Ophthalmological Section, Mt. Sinai Hospital, April 2, 1936.

In June, 1931, in the Archives of Ophthalmology, the writer reported a case of bilateral anophthalmos.¹ Since then, he has come across another case of anophthalmos, a unilateral malformation with an orbitopalpebral cyst in the lower lid of the left eye, and this time was successful in removing the cyst with the globe. The case is herewith presented together with the microscopic examination of the specimen.

I. B., a boy aged 7 years, came to the New York Eye and Ear Infirmary, to the clinic of Dr. Key. The child, the third of a family of six children, was born at the Israel Zion Hospital, in Brooklyn, with only one eye. The parents are Polish Jews, not related to each other. The father denied any venereal history. The Wassermann reaction of both child and father was negative. As far as the father knew, no other similar case had occurred in his family.

The child had a perfectly normal right eye. When the lids of the left eye were separated, a cavity was visible with a small blue speck at its apex, probably the rudimentary cornea. A small cystic mass was found underneath the lower lid of the left eye.

On April 25, 1933, the rudimentary globe was removed under general anesthesia, and the specimen referred to Dr. Joseph Levine, whose report follows:

Pathological Report: Throughout the specimen there was no completely developed layer of the globe. Many areas of chromatophores were present and interspersed in these areas were irregularly shaped, calcified patches in some of which true bone cells appeared. In other areas the calcified masses were round and resembled psammomata. Most of the tissue was connective tissue with some fat globules scattered here and there.

Rudimentary formations of the retinal layers were present but nowhere rods or cones. In one area there were several groups of cells which appeared to be nests of epithelial cells and were possibly the "anlage" of the cornea. No cyst formations were found. In one portion there were many blood vessels but in other areas these were extremely scanty. Diagnosis: Rudimentary eyeball.

An X-ray film of the head and of the optic foramina showed that the frontals were exceedingly rudimentary. The orbit on the left side was slightly smaller than that on the right side. The optic foramen on the right side was normal, the left considerably contracted and irregular. The sella turcica was normal and of infantile type. True anophthalmos without some vestige of globe, is very rare; many cases with



Fig. 1 (Rosenbaum). I. B. at the age of seven years.

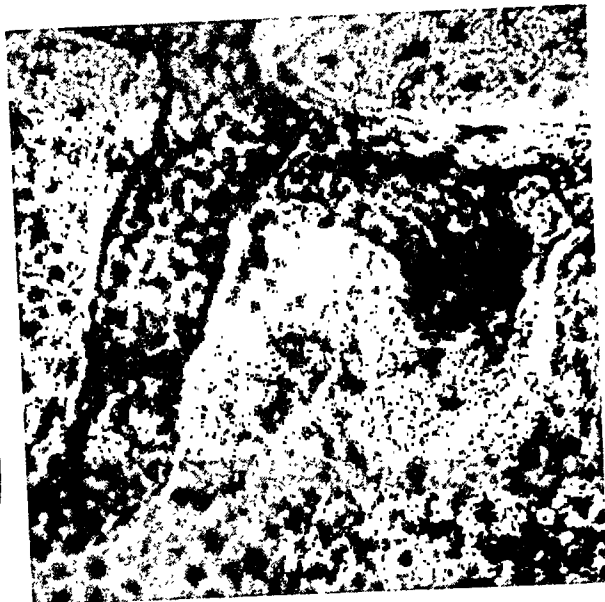


Fig. 4 (Rosenbaum). Section through rudimentary globe, high power, showing bone deposits.



Fig. 2 (Rosenbaum). Sketch of wax impression of socket.



Fig. 3 (Rosenbaum). Section through rudimentary globe, low power, showing bone deposits.

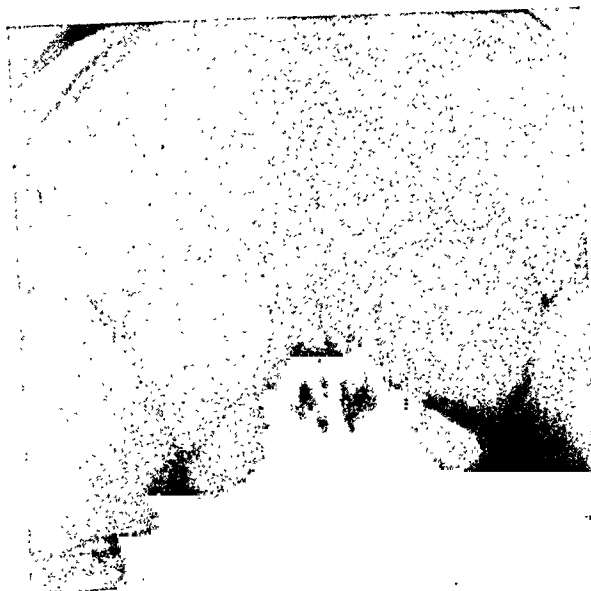


Fig. 5 (Rosenbaum). Roentgenograph of skull, showing unequal size of orbits; the left smaller than the right.

cyst formation, however, have been reported. According to the literature, the left eye is more often affected than the right, when the defect is unilateral. In about one half of the cases reported the

other eye had some developmental defect, such as coloboma. In my case, no malformation was present in the right eye.

Those authors who have had the

good fortune to examine the cyst microscopically, for the most part found "Retina perversa," although others reported glial formation. The cause is believed to be due to extreme ectasia, occurring in the defectively closed fetal cleft.

Nathanson² stated that there are two groups: one, a true microphthalmos; the other, a rudimentary globe; both with cyst formation. In his opinion the cause is not clear, only one thing being certain; namely, that there has been no inflammatory process.

In cases of microphthalmos in which the eye was very rudimentary, there has almost always been an adjoining cyst; but many times the cyst was missed during enucleation, for the wall is so thin that it may be incised and the fluid escapes, leaving a shrunken shell after fixation. This is what probably happened in my case, for no vestige of cyst was visible microscopically.

Much experimental work has been done by Guyer and Smith³ and by Landauer,⁴ on the creeper fowl. These men tried inbreeding and cross breeding to determine whether any hereditary cause exists that might lead to the maldevelopment.

Landauer stated that dominant genes with recessive lethal action in several organisms have often been found associated with chromosomal changes, such as section deficiencies, deficiency of a whole chromosome, translocation, and so on. It has been shown that the first deviation from normal development that can be found in homozygous embryos is a general inhibition of body growth; this retardation of growth only secondarily seems to bring about the various malformations that are found in late developments.

Fred Hale⁵ described experimental work on the breeding of pigs by a vitamin-A deficiency. Nevertheless, the heredity principle due to recessive factors from heterozygotes must be taken into consideration. Of course, according to his experiments, absence of vitamin A is a cause, but it does not exclude the lack of other vitamins nor combinations of vitamins which may also be a cause.

Other experimenters injected toxic substances into chick eggs, or mutilated them, and succeeded in obtaining chicks with undeveloped eyes, or no eyes at all. X rays were also tried and similar malformations resulted.

It is possible that a point mutation in the genes might have a general retarding effect on growth, but it is more likely that a section deficiency in the chromosomes is responsible for the defects. The maldevelopment, therefore, may be looked upon as a germ variation. This, of course, may also be parasitic or toxic.

Hess⁶ concluded that inflammatory processes do not play the chief role in the causation of abnormalities, as was formerly believed.

Ochi⁷ found in his experiment on the chick, the proportion of microphthalmos to anophthalmos as three to two, and concluded that at the beginning of development, any factor, chemical or physical, which can disturb the normal condition of the blastoderm, in its circumference, may bring about an abnormal differentiation of the embryo. If the disturbance is great, total arrest of development occurs; otherwise, partial. Any chemical or physical injury, sufficient to disturb the normal condition of the blastoderm, may result in embryonic deformities.

As to the cyst formation, all the cysts are the result of ectasia due to coloboma of the retina, choroid or sclera, to any one or all three, and these cysts may communicate with the vitreous or may be subretinal. There have been cases in which retina and choroid were undeveloped and the cyst wall consisted of sclera only.

Causes other than toxic may be hemorrhages, sudden pressure, possibly amniotic strands, and vitamin deficiencies. A spontaneous coloboma may occur without toxins. Whether qualitative hereditary changes can take place in the chromosomes, has not yet been ascertained. When at the development of a gene, one has a chromosome in excess, and the other a chromosome less, a defect may occur; either a propulsive pithecoïd or recessive shrunken fetal condition.

A glance at the literature shows that the maldevelopment of the eye is associated with other maldevelopments of the body, such as of the extremities, and of other portions of the head, giving the picture of phocomelus. It is possible that in the union of the heterozygotes, the inherent cause of maldevelopment exists. The amount of abnormality in the chromosomes may be various, resulting in more or less of deformity. The smallest amount of section deficiency in a chromosome may have

a lethal effect on mutation. It certainly is different from atavism.

Conclusion

Every idiogenetic malformation has its ontogenetic characteristics, which are inherent in its gametes. It is important to note that such embryonal end result is not pathological, but only differentiated, as a result of arrest of development.

61 West Eighty-eighth Street.

References

- ¹ Rosenbaum, M. Congenital anophthalmos with orbitopalpebral cyst. *Arch. of Ophth.*, 1931, v. 5, June, pp. 884-889.
- ² Nathanson, L. *Arch. f. Ophth.*, 1908, v. 67.
- ³ Guyer, M. F., and Smith, E. A. Studies in cytolytins. *Jour. Exper. Zool.*, 1918, May, pp. 65-82.
- . Studies in cytolytins. II. Transmission of induced eye defects. *Jour. Exper. Zool.*, 1920, v. 31, p. 171.
- ⁴ Landauer, W. Ueber die entwicklungsmechanischen und genetischen Ursachen des Coloboms und anderer embryonalen Augenmissbildungen. *Arch. f. Ophth.*, 1932, v. 129, pp. 268-273.
- . Studies on the creeper fowl. *Jour. Genet.*, 1932, v. 26, pp. 285-290.
- . Studies on the creeper fowl. *Jour. Genet.*, 1931-1932, v. 25, pp. 367-393.
- . *Jahrb. f. Morph. und mikros. Anat.*, 1933, v. 32, pp. 359-411.
- ⁵ Hale, F. *Amer. Jour. Ophth.*, 1935, v. 18, Dec., pp. 1087-1092.
- ⁶ Hess, C. Beiträge zur Kenntniss der pathologischen Anatomie der angeborenen Missbildungen des Auges. *Arch. f. Ophth.*, 1892, v. 38, pt. 3, p. 93.
- ⁷ Ochi. Experimental study of histogenesis of eye abnormalities in the chick embryo. *Brit. Jour. Ophth.*, 1919, Oct. pp. 433-443.

NOTES, CASES, INSTRUMENTS

DIATHERMY IN CATARACT EXTRACTION

THEODORE L. TERRY, M.D.*
BOSTON

A secure grip on the lens and its capsule would greatly simplify the process of intracapsular cataract extraction and reduce the hazards of the operation. A very secure grip can be obtained on the lens by means of diathermy coagulation. The reports of Lacarrère,¹ Moreu,² and others led me to investigate the method.

Two theoretical questions arose: 1. Can the passage of an electric current between two electrodes, one within and one outside of the eye, cause glaucoma or hypotony by producing disturbance of the pH and chemical balance between the tissues and the blood stream? 2. Can the passage of an electric current between two electrodes, one within the eye and one outside the eye, injure the retina so as to destroy vision? In one case Walker³ feels this may have been the cause of destruction of macular vision in an operation for separation of the retina.

By means of eyes of laboratory animals and enucleated human eyes an electrodiaphaque somewhat similar to that of Moreu was used in an attempt to develop a satisfactory operative technique. It was found that a surprisingly firm grip on the lens could be secured. In brief, my modifications of the Lacarrère-Moreu technique were: 1. Corneal section of two fifths instead of three fifths of the corneal circumference. 2. Electrode applied to the lens well above the anterior pole after iridectomy. 3. Lens not tumbled. 4. Electrodiaphaque so constructed that the wire from the diathermy unit can be detached after the current is switched off, so as to facilitate manipulation of the instrument in delivery of the lens. 5. Moder-

ate counterpressure used below. 6. It was found most satisfactory to turn on only a small amount of current (the amount usually used in Safar operation)** to permit the insertion of the electrode tips to their full depth, then to increase the current to produce sufficient coagulation around the electrode points.

When this modified technique was used for cataract extraction, the lens was satisfactorily removed without immediate complication in six cases. The later disastrous results in two cases and occurrence of glaucoma in two other of these cases induced me to abandon the method. Moreover, it does not seem to me that the possible advantages of diathermy extraction warrant the risk of further operations of this type on patients.

Two of the patients developed peculiar deep, dense, vascularized infiltrations of the entire upper half of the cornea of the eye that was operated on. The earliest appearance of the opacity was three days after the cataract extractions. In one of the cases in which glaucoma developed vision was lost in spite of decompression but in the other case the glaucoma was relieved by trephining.

I have no satisfactory explanation for these complications. It does not seem possible that my small modification of the technique of Lacarrère or Moreu could account for this. The electrode or the glass insulation which made up the handle did not come into contact with any tissue other than the lens during the entire operation.

Since this was written a paper by Khalil⁴ appeared in which the author stated that, "one of the cases had keratitis for some time after the operation, probably through overdosage."

243 Charles Street.

* From the Massachusetts Eye and Ear Infirmary and Harvard Medical School.

** To give the amount of current in M.A. would be less specific because of variation in types of diathermy units in use.

References

- ¹ Lacarrère. Arch. de Oft. Hisp.-Amer., 1932, v. 32, p. 293.
- ² Moreu. Amer. Jour. Ophth., 1935, v. 18, p. 739.
- ³ Walker. Trans. Sect. Ophth., Amer. Med. Assoc., 1934, p. 35.
- ⁴ Khalil. Brit. Jour. Ophth., 1936, v. 20, no. 3, p. 167.

APPARENT INCREASE OF HYPEROPIA UP TO THE AGE OF NINE YEARS*

E. V. L. BROWN, M.D.
CHICAGO

It has been very generally held that all eyes are hyperopic at birth and gradually lose some of this hyperopia or become myopic in the pre-school and early school years. One group has held that there is a marked tendency to "emmetropization" during this developmental period. In a paper by Kronfeld and myself in 1929,** this view, that decrease of hyperopia is the rule, was brought into question. The number of cases then at hand was relatively small (110) and data now at hand permit of a more critical study of the subject. The material now consists of 604 eyes, each of which had its refraction determined under atropine cycloplegia upon two or more occasions, one or more years apart, before the ninth year of age.

Briefly, the study of the group as a whole shows that 63 percent of such eyes have not become less hyperopic but more hyperopic; 29 percent, only, were found to have any decrease of their hyperopia; 8 percent showed no change.

But as every one knows by far the greater number of children brought to the eye doctor in their earlier years come because of strabismus, and when this series is analyzed in this way another picture is found. Strabismus was found in 445 or 74 percent of my cases and 69 percent of these showed an increase of hyperopia between the two examinations; only 24 percent became less hyperopic; 7 percent stood still. In the 159 nonstrabismic eyes, however, only 47 percent showed increase of hyperopia; 42 percent showed less hyperopia and 11 percent stood still. The average period of observation for the children with strabismus was 2.6 years and the average increase per year for those that did increase their hyperopia was 0.41 D.; the average change for

those who showed decrease was 0.24 D. per year; 7 percent showed no change. The average period of observation for the eyes without strabismus was two years and the increase of hyperopia, among the 47 percent who showed increase, was 0.33 D. per year; for the nonstrabismic eyes that showed decrease of hyperopia the average change was 0.37 D. per year.

Comment

The number of cases without strabismus is too small for definite conclusions (159 eyes) but as far as it goes it does not support the generally accepted view that eyes become less hyperopic in the pre-school and early school years, for nearly half of the eyes studied by the writer (47 percent) became more hyperopic. More material is needed.

The 445 strabismic eyes, however, constitute a real challenge to the view that all or most eyes become less hyperopic in early childhood, for 69 percent of them were found to be more hyperopic.

Summary

At a second or subsequent examination under atropine cycloplegia one or more years after a first examination, 69 percent of 445 eyes of strabismic children under the age of nine years showed more hyperopia.

Forty-seven percent of 159 nonstrabismic eyes in the same age group also showed an increase of hyperopia at a second examination. The number of nonstrabismic eyes is too small upon which to base a final conclusion but each group and the combined groups constitute a challenge to the generally accepted view that children's eyes, hyperopic at birth, regularly become less so in the pre-school and early school years.

950 East 59th Street.

CASE OF MARKED EXOTROPIA TREATED WITH STRONG CONCAVE LENSES*

MAURICE L. GREENE
SAINT LOUIS

Use of strong overcorrection of myopia is certain to be criticised by many.

* Read before the Saint Louis Ophthalmic Society, March, 1936.

* Read before the Chicago Ophthalmological Society, March 16, 1936.

** Brown, E. V. L., and Kronfeld, P. C. The refraction curve in the U.S.A. with special reference to changes in the first two decades. *Compte-Rendu du XIII Concilium Ophthalmologicum*. Amsterdam, Den Haag, September, 1929.

Textbooks make the dogmatic statement that all cases of myopia are to be corrected by the weakest minus lens with which the patient sees best. Parsons, in his last edition, published in 1934, says, that every surgeon agrees that myopia must never be overcorrected and advised a slight undercorrection in most cases. The same author in speaking of divergent strabismus seems to agree with Donders's observations regarding the relationship between poor convergence power and divergent strabismus and states that in divergent strabismus slight overcorrection is indicated.

DeSchweinitz states that in divergent strabismus a full correction of my-

if an overcorrection is maintained for any great length of time, a weakness of adduction develops which is detrimental to the patient in later life, particularly when he reaches the presbyopic stage. Overcorrection of myopia, however, has the exact opposite effect in that it stimulates accommodation by making the patient artificially hyperopic. It is generally recognized that patients with myopia develop a tendency to divergence due to poor convergence power, so that it seems only logical that some attempt should be made to increase the convergence power. Repeated efforts of accommodation increase the adductive power and make fusion easier.



Fig. 1 (Greene). Position of the eye before glasses were ordered.

Fig. 2 (Greene). Position of the eye after overcorrection had been worn for one year.

opia should be made, but does not advocate an overcorrection. He does, however, overcorrect the hypermetropia in convergent strabismus. He further states that in exotropia associated with hyperopia, the latter may be undercorrected.

In the opinion of W. T. Davis moderate overcorrection of myopia in divergent strabismus may be desirable as a temporary measure.

Most of the authors in discussing orthoptic training refer to the refraction in these cases merely by saying that the patient was given their best correction so that apparently the practice of overcorrection of myopia in cases of divergent strabismus is not generally followed and is actually condemned by many. Yet why should the myopia not be overcorrected in an effort to stimulate accommodation and thus produce a tendency to convergence?

Overcorrection of hyperopia leads to a tendency to divergence, due to the state of artificial myopia produced, and, unquestionably in many of these cases,

The following case serves to illustrate what can be accomplished by this type of treatment:

A. F., a white male, aged 21 years, a university student, was first seen in March, 1934, his chief complaint being impaired vision. The patient was very much concerned about a divergent strabismus of the right eye which was almost constant. This divergence had been first noticed when he was about 10 years of age. Glasses had never been worn. With the stereoscope he did not have simultaneous binocular vision. The vision in the right eye was 20/50 and in the left eye 20/40. The divergence measured about 35 degrees. It was impossible to obtain measurements of duction, for the right eye would immediately diverge and the patient would have single vision when a prism was placed over either eye.

Under atropine the refraction was: O.D. —1.50 D.sph.; O.S. —1.25 D.sph.; and with this correction vision was 20/15 with each eye.

The position of the eyes, however, was unimproved after wearing this for

several hours, but with a strong minus addition there was a definite improvement in position.

Glasses were ordered: O.D. —2.50 D.sph.; O.S. —3.0 D.sph. With this correction the patient's vision was still 20/15 right and left, but there was only a slight amount of divergence—5 to 10 degrees being present. These glasses were worn with complete comfort for six months, but the right eye gradually became more and more divergent and in September, 1934, new lenses were prescribed: O.D. and O.S. —4.50 D.sph.

Despite the fact that the patient was overcorrected about three diopters right and left, his vision was only slightly blurred, being 20/20 in each eye.

After wearing this correction several weeks the tendency to divergence had entirely disappeared. With the stereoscope he had good simultaneous binocular vision, but fusion was still faulty. He remained comfortable with this correction throughout the entire school year and the position was excellent—only rarely was there any tendency to divergence.

One year from the date on which the strong overcorrection had been made, he still had excellent position and no discomfort. O.D. and O.S. vision was 20/20 minus, with good simultaneous binocular vision and fusion at times. At this time he was given orthoptic training with the Wells and Guibor charts and the stereoscope. He was seen once a week in the office and used the stereoscope 20 minutes morning and evening at home. After five months of

this training he had excellent position; with the Maddox rod he had no hyperphoria and but one degree of esophoria and he had developed excellent fusion and depth perception.

He complained somewhat of discomfort after doing near work with the strong correction; accordingly, the strength of the minus spheres was reduced to —3.50 D. This correction was worn for about six weeks with no further discomfort and no change in the tendency to divergence. Several weeks ago the spheres were further reduced to —2.50 D. right and left, but at times the right eye shows a tendency to diverge again. It may be necessary again to add the stronger correction. He has had no appreciable increase in his myopia, as with O.D. —1.75 D.sph. and O.S. —1.50 D.sph. his vision is 20/15 minus.

It is still difficult to measure the duction power, but adduction is certainly much stronger than it was before he began wearing the strong concave lenses. Adduction equals about 4-5 degrees, but measurements are very uncertain as are the measurements of the convergence near point. Convergence, of course, is at times still deficient, but for the greater part of the time his convergence near point is quite normal.

He has a slight amount of right hyperphoria (1-2 degrees) at 20 feet, and an esophoria of 1-2 degrees for near with the Maddox rod, and about the same amount at 20 feet.

706 Missouri Building.

ANNOUNCEMENT

We wish to call the attention of our subscribers to a change in format of the Journal beginning with the January number, the purpose of which will be to produce an improved magazine. More space has been placed between the lines and more pages added. A better quality of paper will be used which should not only facilitate reading but also lend itself to finer reproduction of illustrations. Numerous other changes will be made.

Beginning with the January issue we shall publish the first of a series of six lectures by Col. Robert E. Wright of Madras, India, on cataract and glaucoma. These lectures were presented to the students of the Los Angeles Midwinter Course of 1936. Any man who has performed more than twenty thousand cataract extractions and a proportionate number of glaucoma operations can certainly speak with authority in pointing out elements in the operations for these conditions which merit serious consideration.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

February 20, 1936

Dr. Charles R. Heed, chairman

A one-meter perimeter

Dr. Alfred Cowen read a paper on this subject which was published in the Journal (November, 1936).

Treatment of detachment of the retina by sclerotomy and the application of the thermophore

Dr. H. Maxwell Langdon said that in November, 1934, a case was reported by the writer, in which a partial detachment of the retina had been successfully treated by sclerotomy and multiple applications, for one minute each, of Shahan's thermophore, at a temperature of 165 degrees.

On November 18, 1935, a patient with detachment of the entire lower half of the retina, in which no tear could be discovered, was operated on in a similar way. The first symptoms had appeared about four months before the operation and the condition was diagnosed as retinal detachment two months before operation. There was complete reattachment of the retina with restoration of the form field, a 15-degree field for red and a corrected central vision of 5/22.

A third patient with detachment of the upper portion of the retina has since been operated on with apparently a good result. This case will be reported in detail later.

Discussion. Dr. Francis Heed Adler said that it is interesting that the external application of heat was one of the first methods employed to produce experimental detachment of the retina. The application of heat produces a serious effusion which will lift off the retina. If one is going to treat retinal detachments by this means it is of the utmost importance to create an outlet for this fluid.

Experimental studies on choked discs

Drs. William A. Jeffers, J. Q. Griffith, W. E. Fry, and A. G. Fewell concluded that: 1. Following the intracisternal injection of kaolin, the albino rat will develop high blood pressure associated with increased intracranial tension, but there will be no retinal venous engorgement nor choked disc. 2. The failure of thorotrast to enter the cervical lymphatics and the epidural connective tissue of the optic nerve of such hypertensive rats suggests that there is obstruction to the usual outflow of cerebrospinal fluid. 3. Kaolin-hypertensive animals do not develop the usual retinal venous engorgement of choked disc upon the implantation of cerebellar tumors. This suggests that the aforementioned block produced by kaolin may be the responsible factor. 4. The exact site of the obstruction to lymphatic flow has not yet been ascertained, but it is probably in the perivascular spaces of the lamina cribrosa and the adjacent dural region. 5. When thorotrast is injected into the cisterna of a normal animal, after the withdrawal of an equivalent amount of cerebrospinal fluid, it will lodge in greatest concentration just central to the lamina cribrosa, and inside the intervaginal sheath. This is evidence that fluid normally flows from the region of the brain toward the eye, and not vice versa. 6. The fact that thorotrast does not collect around the peripheral end of the optic nerve in the kaolin-hypertensive animal suggests that the usual anterior current of lymphatic flow is obstructed.

Discussion. Dr. Francis Heed Adler said that in 1924 Parker showed that the degree of swelling of the disc depended somewhat on the intraocular pressure, as the swelling was always greater on the side in which the intraocular tension had been reduced by an Elliot trephining operation. He had at present a patient under observation who demonstrates that this is not only true of choked disc due to raised intra-

cranial pressure but also to the swelling produced in hypertensive neuroretinitis. This patient was operated on four years ago for chronic simple glaucoma. An Elliot trephining was performed on the right eye. The tension in this eye has remained subnormal. Within the last year he has developed an arteriosclerotic retinitis in both eyes but the right disc is swollen about a diopter and a half whereas there is no swelling of the left disc. All of the veins are much more dilated on the right side and there are many more hemorrhages than on the left.

It is unfortunate that the authors have to use such small animals in their studies on choked disc, for it might be interesting to note whether reducing the tension in one eye of the experimental animal might not be effective in producing choked disc.

William Porterfield, an almost forgotten optic physiologist

Dr. Burton Chance read a brief account of William Porterfield and his works on the eye, published in Edinburgh about the middle of the eighteenth century.

Extraction of nonmagnetic intraocular foreign bodies (report of three cases)

Dr. James S. Shipman said that the first and the last cases are very similar, both patients having received their injury while working with fine copper wire on coil winding machines. The second patient was injured by a dynamite-cap explosion. All three patients were operated on by means of a posterior sclerotomy through the lips of which a small capsule forceps was inserted, and while looking with the ophthalmoscope through the pupil the operator was able to grasp the foreign body in the vitreous and extract it through the posterior sclerotomy opening. In the first case the sclerotomy wound was closed with interrupted black episcleral sutures, and in the last two cases the sclerotomy wound was first closed with the actual cautery.

The first patient made an uneventful recovery and for five weeks following

the operation the vision was normal, but at the end of this time a retinal detachment was noticed. This became more marked and approximately two months after the original accident the first retinal-detachment operation was performed with Weve needles. This was unsuccessful and two more retinal-detachment operations were performed; in the last Safar needles were used. No permanent success followed any of the retinal-detachment operations. Three years following the patient's injury, examination showed a complicated cataract with divergence of the injured eye and only bare light perception.

The second patient made an uneventful recovery, and in spite of the fact that he had a partial posterior cortical cataract from the time he was first seen he still has useful vision, 6/15 with correction, two years after his injury. There was no evidence of any retinal detachment at any time and the visual field in this eye is full. The cataractous changes have remained practically the same.

The third case is a more recent one, the patient having been injured in November, 1935. More reaction was experienced following operation in this case than in the other two cases, and the partial cataract which was present at the time of the first examination became complete following operation, necessitating a linear extraction. Following the cataract extraction the patient made an uneventful recovery. At the present time the eye is quiet and with a plus 13.00 D. sphere the vision is 6/6—. The visual field is practically full and there is no ophthalmoscopic evidence of any retinal detachment.

Discussion. Dr. Alfred Cowan said that a foreign body, as seen in the vitreous with the ophthalmoscope, will appear by refraction to be farther forward than it actually is. This can be seen easily when a diagram is drawn to show how the rays, on leaving the eye, are bent toward the perpendicular. The foreign body will always be projected along the emergent ray. Roughly it will appear to be 25 percent nearer to the front of the eye than it actually is.

A. G. Fewell,
Clerk.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

February 14, 1936

Dr. H. F. Binger, president

Gunshot wound of orbit

Dr. Archie D. McCannel (Minot, N.D.) reported the following case of an unusual injury to the eye. The patient, Miss S., aged 21 years, a school teacher, was shot by a disgruntled suitor with a .22 caliber rifle. The rifle was six feet from the patient's face when it was fired. The bullet entered the outer angle of the orbit, passing about 2 cm. external to and 1 cm. below the outer canthus, fracturing the lower rim of the orbit, passing through the orbit, through the lower portion of the ethmoid and sphenoid bones and, entering the postnasal space, was evidently swallowed. X-ray films of the abdomen showed a portion of the lead bullet in the upper right abdominal quadrant. It was recovered on the fifth day. There was profuse bleeding at the time from the mouth and nose. The course of the bullet could be determined by X ray.

Examination of the eye showed a dilated pupil. Otherwise, the eye looked normal externally, except for swelling of the lids. The fundus showed a number of small retinal hemorrhages involving the lower half, the largest one being in the inferior temporal quadrant. Vision was reduced to the ability to detect hand movements in the lower temporal field.

The canal of Schlemm and its anastomoses

Dr. Georgiana Dvorak Theobald, of Chicago, said that there are four plexuses composed of arteries and veins: (1) the conjunctival; (2) the episcleral; (3) the scleral; and (4) the deep intrascleral. Each plexus is distinct but anastomoses not too freely with each of the others.

The canal of Schlemm is a lymphatic channel, plexiform and varicose, which lies deep in the scleral limbus; it is separated from the anterior chamber by

the trabeculae corneo-sclerale (pectinate ligament); from its inner surface many small canals leave at right angles and connect with the spaces between the trabeculae. These were first described by Sondermann in 1933. They establish direct communication with the anterior chamber. From the outer surface of the canal of Schlemm emerge large collector tubes which connect with the deep intrascleral plexus. This deep intrascleral plexus should be considered as a lymphatic, but more work must be done on this question. The collector trunks are irregularly placed—in the eye demonstrated there were 29.

Discussion. Dr. Walter Fink (Minneapolis) asked if Descemet's membrane continued into the trabeculae and if there were a direct communication between the anterior chamber and the canal of Schlemm. Dr. Theobald said that aqueous enters the spaces between the trabeculae and through the inner canals of Sondermann, and directly flows into the canal of Schlemm.

Dr. Theobald said, in answer to Dr. George McGeary, that both the canal and the veins in the limbus are lined with a single layer of endothelial cells which lie in the sclera with no intervening connective tissue. Retzius likened the canal of Schlemm to the dura mater because it remains open, even when empty.

W. E. Camp,
Secretary

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

March 17, 1936

Dr. James J. Regan, presiding

Corneal dystrophy

Dr. Trygve Gundersen reported two cases on this subject. The first was referred to the Howe Laboratory by Dr. William D. Rowland from the Massachusetts Memorial Hospitals. The patient presented diffuse corneal haze; epithelium perfectly smooth; pupils active; no signs of previous inflammation. The tension was 11 mm. Hg in each eye. Vision in each eye was 20/200. The

blood test was normal and medically nothing could be found to account for the condition. A biopsy was taken, sections of which were not ready. A few days later at the Perkins Institute for the Blind, Dr. Gundersen found a 10-year-old boy with exactly the same condition but not so severe. He was also studied in the same manner and very little pathology was found. The patient was presented to demonstrate the condition. Dr. Gundersen said it was impossible to classify this disease although he thought it was very closely associated with nodular keratitis.

Sarcoma of the iris

Dr. William P. Beetham presented a lady who had been seen by him two years previously. The elevated nodule in the iris was carefully examined, measured with a scale in the ocular of the corneal microscope and drawn on the record. The patient was asked to return in two months. She was not seen again until one month ago when the nodule again attracted attention. It did not really appear much larger, but seemed to have a much more irregular contour than when first seen. Dr. Beetham considered the possibility of a sarcoma or a congenital thickening of the iris. Dr. Frederick E. Verhoeff had favored the diagnosis of sarcoma and because of the favorable circumstances had advised removal by iridectomy. The visual acuity was 6/6; the lesion was nonpigmented; transillumination was of no value. With the slitlamp could be seen what appeared to be normal iris stroma pushed forward by tissue beneath it.

Dr. Beetham said there are two types of sarcoma of the iris, pigmented and nonpigmented. In the pigmented type there is a nodular condition or diffuse "ring sarcoma." He said it is a rare disease; only about 100 cases are to be found in the literature up to 1930. In the opinion of some writers it starts in pigmented naevi known to have been present many years previously, while others consider it to have started in the stroma of the iris. Microscopically, they consist, almost without exception, of large spindle cells. No data are avail-

able as to metastases. Sarcoma of the iris is usually confused with iris cyst, congenital defect, or inflammatory process. The treatment advised is enucleation or an iridectomy if the neoplasm is small, well defined, and near the pupillary margin.

Choroideremia

Dr. J. Herbert Waite read a paper on this subject.

Experimental exophthalmos

Dr. Harry B. Friedgood from the Department of Physiology, Harvard Medical School, said that exophthalmos has been produced experimentally in mammals by four methods; namely, faradic stimulation of the cervical sympathetic chain or its superior ganglion (dog, cat, rabbit), phrenicosympathetic anastomosis (cat), daily injections of a chemically crude extract of the anterior hypophysis (guinea pig, dog), and daily injections of acetonitrile (rabbit). These mammals possess a system of orbital smooth musculature which, on contraction, is mechanically in a position to induce protrusion of the orbit. These muscles are known to be directly stimulated during the activity of the cervical sympathetics (first two methods), and are presumably involved (either directly or indirectly) in the production of exophthalmos by the third and fourth experimental procedures.

Exophthalmos and hyperthyroidism do not appear simultaneously after daily injections of an alkaline anterior hypophyseal extract. The exophthalmos usually does not become obvious until the height of the hyperthyroid state has been passed and the metabolic disturbance is subsiding (spontaneous remission); it is actually most marked when the basal metabolism has returned to a normal or subnormal level. Exophthalmos can also be induced in guinea pigs which have been completely thyroidectomized prior to injection with anterior hypophyseal extract. These experiments indicate that exophthalmos is not due to the hyperthyroidism. It is rather to be attributed to a substance in the extract which acts

without reference to a stimulating influence on the thyroid gland, and may actually be more prominent in the presence of a normal or subnormal basal metabolism.

The exophthalmos produced in rabbits by Marine, with injections of acetonitrile, is likewise independent of a hyperactive state within the thyroid gland. As a matter of fact, Marine has shown that it appears only in those animals which simultaneously develop hyperplastic parenchymal changes in the thyroid gland. He interprets these histological findings as evidence of functional exhaustion with hypofunction of the thyroid gland.

These experimental observations on the relation between the functional state of the thyroid gland and the occurrence of exophthalmos are of particular interest in view of the exophthalmos which is aggravated by or occurs for the first time after thyroidectomy for exophthalmic goiter. One must, however, make this comparison with utmost conservation because the anatomy of the orbit in man is said to be different from that of mammals in that the smooth musculature is generally vestigial in the former.

Trygve Gundersen,
Recorder.

WASHINGTON, D.C., OPHTHALMOLOGICAL SOCIETY

March 2, 1936

Dr. James N. Greear, Jr., president

Three cases of fracture of the skull with ophthalmological symptoms

Capt. Ross T. McIntyre, U.S.N., said that the first case was of a man who was struck in the head with an automobile crank August 7, 1935. There were a deep laceration of the scalp over the right frontal region, several abrasions and contused areas in the temporal region, and marked swelling of the eyelids; also escape of blood and of a sanguinous fluid from the nose and from the right external auditory canal. The left ear was normal. X-ray films of the skull demonstrated a simple fracture in the right parietal bone with an exten-

sion into the right wing of the sphenoid. Spinal puncture showed no increased intraspinal pressure. On September 11, 1935, further X-ray examination showed a slightly irregular fracture line in the right temporal bone with an ascending limb almost through to the axis of the body. There was a stellate line extending forward and downward through the middle fossa. The patient complained of headache and loss of vision in the right eye. There was a rupture of the tympanic membrane of the right ear and a decided decrease in hearing for high tones, which has remained. The left ear was normal in all respects. Visual fields for form and color in the right eye were concentrically contracted. The left fields were normal. The eyegrounds were normal. The visual defect has remained constant in the right eye, vision being 2/200 unimproved by correction. It would seem that the damage must have been anterior to the chiasm and at the location of the optic foramen.

The second case was of a man who was admitted to the hospital, unconscious, October 26, 1935, after an automobile accident. X-ray films showed a compound fracture of the right frontal bone into the right frontal sinus. The patient recovered from shock and progressed nicely until November 6th. He had complained of disturbance of vision in the right eye. The field of vision was concentrically contracted in the right eye and normal in the left. The fundi showed no pathology. On the 6th of November he showed signs of meningeal irritation and complained of marked loss of vision in the right eye. The pupil was markedly dilated but reacted to light and to accommodation. On November 11th he had severe headache and definite clinical signs of meningitis. Spinal puncture showed marked increase in pressure of the spinal fluid and smears and cultures were positive for pneumococcus. The patient died the following day. The cavernous sinus was infected and thrombosed 24 hours before his death. At autopsy the fracture was found to extend into the inner table, involving the optic fissure and injuring the optic nerve. There was a small hematoma lying on the nerve it-

self anterior to the chiasm. The fracture in this case was more severe but still a fair amount of vision remained in the injured eye.

The third case was of a man who fell into a coal pit, in August, 1935. Examination showed the patient to be suffering from shock and breathing with great difficulty. There was a three-inch laceration of the forehead extending over one-and-one-half inches above the left eye backward and temporally to the hair line. There was considerable swelling of the left eye and bleeding from the left side of the nose. The patient complained of loss of vision in the left eye. No intraocular pathology was found, only swelling of the soft tissues of the orbit and hemorrhage into the conjunctiva. The right eye was normal. X-ray films showed a fracture of the left wing of the sphenoid. There was no apparent displacement of the fragments. There were also a fracture of the 7th cervical vertebra and a fracture of the left clavicle. Visual fields were normal in the right eye, with complete loss of vision in the left. The iris was completely paralyzed. Ophthalmoscopic examination showed no evidence of any atrophy in the nerve head and no changes in the vessels of the retina. The damage here is similar to the previously reported case but there was complete loss of vision.

Discussion. Dr. James N. Greear said that he had had a similar case in a woman of 60 years who had fallen down stairs, fracturing her arm. Her attention was entirely taken up with the fractured arm and she had not noticed at the time the failure of vision in one eye. Six weeks after her injury she had only 20/200 in one eye with beginning atrophy and marked contraction of the visual field. An X-ray film of the skull showed no definite fracture line but there was some disturbance in the optic foramen. He believed that she did have a fracture through the optic canal. The accident happened six months ago and the vision is still 20/200.

Another case was that of a man who had only one eye and who ran into a tree. He was not rendered unconscious. Eighteen hours later he lost all central

vision. There was a loss of the upper nasal field and four days later complete loss of the upper field, an altitudinous hemianopsia. There was papilledema of the lower margin of the disc. Two weeks later he had lost his peripheral field down to 20 degrees on the temporal side and about 5 degrees on the nasal. There were hemorrhages on the disc. His central vision is now normal, 20/15 but his field is tubular.

Retinoblastoma

Major Raymond O. Dart of the Army Medical Museum gave a brief review of the histology of retinoblastomas, their mode of extension, and the prognostic significance of extension outside the eyeball.

Uveitis with secondary glaucoma accompanying spontaneous absorption of the crystalline lens

Dr. Robert H. Courtney of Richmond reported five cases of acute uveitis with secondary glaucoma accompanying partial absorption of the crystalline lens in the fellow eye of patients who had previously had a successful cataract extraction from the first eye. In four of these cases the lens was extracted from the inflamed eye and this procedure was followed by very prompt subsidence of the uveitis. The fifth patient could not be operated upon because of extraneous circumstances and the eye was subsequently enucleated.

Ernest Sheppard,
Secretary.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 10, 1936

Dr. C. D. Blassingame, presiding

Malignant melanoma of choroid

Dr. R. O. Rychener reported a case of this condition in a man aged 33 years. Four years previously the vision in the left eye had begun to fail resulting in blindness for the past year. A week before his first examination the eye had become moderately injected and painful.

There was slight ciliary injection, a shallow anterior chamber, and newly formed vessels on the iris. Sheets of vitreous exudate and detachment of the retina below were noted. The eye transilluminated perfectly in all directions. Tension was 62 mm. Hg (Schiötz).

Enucleation a week later revealed the presence of a malignant melanoma of the choroid which had extended through the sclera by way of the canal for one of the vortex veins. The tumor arose near the optic disc, was mushroom shaped, extending 5 mm. into the eye, rather heavily pigmented, and relatively vascular. Its position with reference to the optic nerve explained the negative result of transillumination.

Intraocular foreign body

Dr. R. O. Rychener reported a case of intraocular foreign body removed by the hand magnet. The patient, E. C. S., aged 37 years, had felt something hit the left eye while striking two hammers together nine days previously. There was a striate corneal opacity with ciliary injection, iritis, and hypopyon. X-ray films showed an intraocular foreign body which was localized 15 mm. behind the corneal center, but as the vitreous was entirely clear it was surmised that the localization was faulty. Application of the magnet disclosed the presence of a magnetic foreign body in the hypopyon. It was removed through a keratome incision below, without complication. A recheck of the localization figures disclosed an

error, the localization really being 4 mm. behind the corneal center.

Plastic operation for deformity of outer canthus

Dr. Phil M. Lewis presented B. M., a colored woman, aged 21 years, on whom he had recently operated for a gross deformity of the outer canthus of the left eye. The patient had been in an automobile accident in November, 1934, and evidently the lacerations had been very poorly repaired. In December, 1934, a plastic operation had been performed in another city. A large thick graft was taken from the forehead just above and apparently partly including the left eyebrow. On coming to the Eye Clinic in December, 1935, she complained of hairs from the graft growing into the eye. She was also much dissatisfied with the appearance of the repaired area.

On January 10, 1936, the entire mass was excised. It was found to contain much sebaceous material and hair follicles similar to a dermoid. The conjunctival fistula was closed. The external canthal ligament was dissected out and anchored with a mattress suture to the periosteum of the orbit, high enough to correspond with that of the other side. By undermining the skin margins the wound was closed without much tension and a pressure bandage applied.

J. Wesley McKinney,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis
WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver
EDWARD JACKSON, Consulting Editor
Republic Building, Denver
HANS BARKAN
Stanford University Hospital, San Francisco
HARRY S. GRADLE
58 East Washington Street, Chicago
EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis
PARK LEWIS
454 Franklin Building, Buffalo
C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City
M. URIBE TRONCOSO
350 West 85th Street, New York
JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York

Address original papers, other scientific communications including correspondence, also books for review and reports of society proceedings to Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.

Exchange copies of medical journals should be sent to Dr. William H. Crisp, 530 Metropolitan Building, Denver.

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis. Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the manuscript editor. Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

CONSECUTIVE EXTRACTION OF LENS AND CAPSULE

In spite of the steadily increasing popularity of intracapsular extraction, details of technique are freely debated. Some tumble the lens after seizing it near the lower pupillary margin; others grasp the capsule above. There is probably a good deal of difference as to the amount of counter pressure employed and the manner of its application. Different operators report varying percentages of cases in which intracapsular extraction is successfully accomplished.

Every well-reasoned and practicable suggestion or variation of technique is worthy of publication, and of trial in the hands of skillful operators who command abundance of material. Many new proposals will be discarded, ultimately perhaps even by their original proponents. Others may prove worthy of general adoption or may point the way to important changes varying from those at first put forward.

Three years ago (*Bulletin et Mémoires de la Société Française d'Ophtalmologie*, 1933, 46th year, page 254) Dejean, of Montpellier, France, modestly proposed a method in which he first opened the capsule and expelled the lens or its nucleus, and then removed the capsule separately as a later step of the same operation. He had ventured to apply the method to only five human subjects. The capsule was opened with a sharp hook instead of the usual cystotome; two oblique incisions being made with their base below and meeting at an angle above. After exposure of the lens, this capsular flap was seized with a forceps having "spatulated" blades. In four cases the procedure had proved practicable and relatively easy, but in the fifth case it had been impossible to seize the capsule.

Working without knowledge of Dejean's description, Horváth, of the Second Eye Clinic at Budapest, has undertaken a somewhat similar operation on

thirty eyes of twenty-six patients with gratifying results (*Klinische Monatsblätter für Augenheilkunde*, 1936, volume 96, page 746). His efforts are based on the desire to remove the lens with its capsule, and on the fact that by the present intracapsular methods combined removal cannot always be accomplished, sometimes because the zonular fibers are too strong, sometimes because the swollen lens does not permit the proper grasp on the capsule.

Experiments with pig eyes seemed to indicate that the capsule could be most successfully removed with forceps if it had been incised above, along the equator of the lens. Trial of this method in the human eye was delayed by the fact that the Budapest clinic was taking up the Knapp method of lens tumbling, by which it was hoped to obtain intracapsular extraction in one hundred percent of the cases. This hope was disappointed and it was found that there was an important number of cases in which intracapsular extraction was impossible.

Horváth describes as follows the technique of his consecutive removal of lens and capsule: An incision involving two fifths of the corneal limbus is sufficient. Complete or peripheral iridectomy is usually performed. With fine forceps the corneal flap is made to gape open, exposing the upper part of the lens. Near and almost parallel with the equator, an incision is made with a discission needle in the lens capsule, sufficiently large to allow the lens nucleus to pass without further rupture of the capsule. After expulsion of the lens, with irrigation if necessary for removal of fragments of lens substance, the corneal flap is again raised, and the open capsule forceps is introduced with one blade inside the capsule and the other in the anterior chamber. The corneal flap is released, and the capsule forceps is carried deeper toward the lower pupillary margin, and ultimately so far that the tips of the forceps blades lie behind the iris. The forceps being closed, traction is made upward, but of course without counter-pressure on the eyeball. Withdrawal of the capsule is aided by pendulum movements in combination with the upward traction. Final withdrawal of the cap-

sule without tearing is facilitated by grasping it also with the fine-tooth forceps which still remain in the left hand.

Like every technique of cataract extraction, this one is not without its possible complications. The forceps may not enter the capsule at the first attempt; in which case the attempt is to be repeated. The same advice is given in case the forceps slide off without tearing the capsule loose from the zonule. The capsule may tear before or after being separated from the zonule: in the former case the capsule is to be seized again, at another point; in the latter case it is better to extract the capsule by means of a blunt hook carried over its free lower margin. A small superior crescent of capsule may remain behind: this may easily be removed, but perhaps is just as well left in the eye. Lens fragments may remain in the anterior chamber but will usually be absorbed without difficulty. Very exceptionally, vitreous prolapse may arise from adhesion between capsule and vitreous.

Horváth recommends his operation particularly for those cases in which successful application of the intracapsular operation appears improbable. But he also commends its general use, since it does not make any greater demands on the operator than does the intracapsular operation.

W. H. Crisp.

THE SCREEN PARALLAX FOR ORTHOPTIC TRAINING

The excellent account of the screen test, given by White in the August number (page 653), gives a clear explanation of its diagnostic value, as developed by the observations and suggestions of Duane. It is both an objective and a subjective test. The eye physician observes the movements of the eyes as they fixate or deviate, under alternate covering and exposure, while attention is fixed on a certain object. The patient, with the covering of first one eye and then the other, perceives an apparent movement of the object looked at; which makes necessary the movement of his eye to the new direction to fixate as directed. Both the

change of apparent position and the muscular action required to fix the eye in the new direction enter into the patient's consciousness. Such a recognition of true and false positions is a most important first step in orthoptic training.

For the older, intelligent patients, this is an exercise that the patient can easily practice for himself. If he is holding the screen in his own hand, and moving it from side to side, this furnishes an additional motor activity very directly connected with the parallax movement. If the patient is really eager to correct the position of his eyes, here is an exercise he can practice without the help of physician or technician, and be conscious of whatever improvement of coordination it brings. In some cases this resource will materially hasten improvement; and the variety of resources will delay the patient's loss of interest and faith in the orthoptic regime. Such exercises require intelligent supervision, and the assistance of technical skill. But they add to the interest of the patient and enlist an exercise of his will power. When the patient describes his, or her, experiences with the exercises, it will sometimes furnish a hint for needed suggestions from the physician. Both may learn from such a comparison of experiences of the obstacles and best means of overcoming them in the early steps of fusion training.

Edward Jackson.

THE TEACHERS' SECTION OF THE ACADEMY

The problem of graduate training of physicians has been under consideration for many years but as yet no entirely satisfactory system has been evolved. Until recently, and perhaps even now, the majority of ophthalmologists have acquired their education in the specialty by acting as assistants in private offices. The absolute need for at least a year of hospital experience to round out the largely didactic teaching in the medical schools has been so well recognized that for many years practically all

medical students have sought hospital appointments. After this service the young man has entered an office as assistant. Trusting thus largely to one or two men for instruction, the results have depended almost entirely on the individual with whom the association was made and on the character of his practice.

The ophthalmological assistant learned practical refraction primarily. No instruction in optics except such as was obtained by collateral reading, clarified the reasonableness of the method employed and few men are capable of understanding a treatise on optics unless it is interpreted for them. This the busy practitioner rarely had time to do even if he had the requisite knowledge; which is quite doubtful, since his training had usually been as sketchy as his assistant's. The student also observed and studied the run of pathologic conditions which enter an office. He had a very limited surgical training. In surgery there is considerable individual variation but usually very little variety in the material and surgical methods of any one man.

These apprenticeships extended from two to three years, during which time the assistant presumably improved his knowledge by the study of books. The chief criticism of this method is that it lacked system and direction. Without instruction and guidance, the interesting subjects are studied whereas the uninteresting and difficult are neglected. From this training, therefore, the assistant was apt to emerge with a poorly balanced education. This fact was so well recognized in many offices that it was routine for the young man after three years as assistant to go to Vienna or other European medical center for an additional year or two of study.

Another method for graduate training that evolved early but could take care of only a few of the applicants was internship in a specialty hospital. In general, this offered good educational opportunities. Its chief lack has been similar to that of office training; namely, directed systematic instruction.

About five years ago members of the Academy who had been studying the

problem for many years thought that something constructive might be accomplished by forming a Teachers' Section. This was accordingly done, and a great deal of time and energy spent by some two dozen men in collecting material and reviewing the subject. This was an essential foundation on which to build. Meetings have been devoted to the presentation of these data to the membership and to pertinent talks. Many excellent suggestions have been made but little action has been taken.

Certain points stand out clearly, of which perhaps the most important is the lack of teachers and facilities for giving adequate postgraduate instruction. There is and always will be difference of opinion as to proportioning the training between the didactic and the practical, but it is possible to outline a satisfactory course. However, to be able to offer this to the large number of men seeking it is now impossible.

There are vastly too many features vital to this subject to justify opening a discussion of details, but suggestions regarding methods for furthering consideration of the problem are appropriate.

It is time now for the formulation of some concrete program in graduate instruction. It can be the basic structure only but should be planned to permit of expansion. This can be done only by a representative group of ophthalmologists and otolaryngologists. Probably the make-up of this committee should be similar to that of the American Board of Ophthalmology. It should be relatively small for reasons of efficiency and expedition. The existing Boards might serve very well but it is a serious question if the same men should be asked to assume this great burden in addition to that which they now carry in their work as examiners.

This graduate problem is exceedingly difficult and its solution will require many years of hard work. Much discussion and fact finding still remain to be done. The Teachers' Section has been excellent but inadequate. Perhaps a hundred and fifty members were in attendance at the dinner this year. An

hour or more was occupied by guest speakers who discussed the broader phases of the subject very interestingly and in a manner similar to that of other speakers in previous years. Then the prepared ideas of half a dozen members were given. Obviously these had been carefully thought out and all deserved long and deliberate discussion with a view to classification, correlation, and the establishment of concrete suggestions. Unfortunately, after the reading of the last of these the hour was late and no discussion at all was possible. The members must have felt a bit thwarted and gone away thinking that this method of considering the problem was rather futile. To have carried the discussion to a conclusion from the point reached by the speakers was obviously not to be considered for it would have required at least a week of daily sessions to have evaluated the diversity of ideas presented.

It is for these reasons that a small representative committee to formulate a plan and present it for consideration by the various national bodies of ophthalmology and otolaryngology is suggested. It would seem best that this should not be the present Boards of Ophthalmology and of Otolaryngology, primarily because the consideration of this problem should be the sole function of this body, otherwise one activity is apt to suffer at the expense of the other, and as already mentioned it is too much to ask of a man that he should contribute as much time as this double duty would require. The board might well, however, be made up of delegates elected from such organizations as are represented on the present Boards of Ophthalmology and of Otolaryngology.

Lawrence T. Post.

BOOK NOTICES

Detachment of the retina and its treatment. By F. Terrien, Prosper Veil, and M.-A. Dollfus. 163 pages, with 45 illustrations in the text and 4 plates in colors. Stiff paper covers.

Masson et Cie, Publishers for the Académie de Médecine, Paris, 1936. Price 40 francs.

The authors hesitate to add to the existing literature on the subject, especially Gonin's magnificent volume. But they feel that personal experiences at the eye clinic of the Hôtel-Dieu and in their daily practice in the past five years may throw light on the subject. They regret the hesitation which leads many colleagues to limit themselves still to subconjunctival injections with loss of valuable time. They have tried all the techniques put forward.

The color plates present interesting examples of different types of retinal tear. Chapter one is devoted to a clinical study of retinal detachment, with a brief discussion of premonitory symptoms and modes of onset, and a detailed discussion of the forms of detachment, especially in relation to type of tear, age of detachment, presence of exudate, condition of the vitreous, and etiology. Of the authors' first 150 detachments, 92 had V-shaped tears with flap. Multiplicity of tears in the same eye was found more frequently with perforations than with flap tears.

Although in case of a visible tear it is desirable to intervene surgically as early as possible, it is advisable to attempt preliminary reapplication of the retina by having the patient completely immobilized for forty-eight hours, wearing stenopeic spectacles. If the detachment is above, the patient's head should be lower than his feet, without pillow. After the forty-eight-hour interval, localization should be carefully undertaken in the dark room.

A large amount of space is naturally devoted to appraisal of the different surgical techniques and their selection for different types of case. Obliterating thermopuncture is reserved for small single tears, well localized, easily accessible, and situated in relatively healthy tissue. Diathermy is used for the small round and frequently multiple tears found in degenerated retinas; and also for very extensive tears, large or multiple, in which a double diathermic bar-

rage, either superficial or perforating, is employed. For macular tears diathermy applied to the macular region has not given the results obtained by Lindner with suprachoroidal injection of caustic potash.

A brief final chapter is devoted to the medicolegal aspects of retinal detachment. W. H. Crisp.

Polychromatic plates for color-sense examination. By Dr. E. B. Rabkin, Director of the Ukrainian Prof. Hirshman Memorial Central Ophthalmic Institute. 40 pages to which are added 20 color plates. Cloth bound. Published by State Medical Publishing Board, Kief and Kharkof, U.S.S.R., 1936. Price 30 rubles.

The twenty diagnostic plates contained in this volume were designed by the author. In general, they are along the lines of the Ishihara plates for testing color vision. But the designs for recognition by the patient consist of numbers and geometric forms (circle, triangle, square). The plates are so planned that it is possible to differentiate between the principal forms of defect (protanopia, deuteranopia, protanomaly, and deuteranomaly). Certain numbers or geometric forms are obvious to the normal eye, whereas the person with defective color vision sees other numbers or forms.

The experimental basis of these plates and their clinical application were worked out in the experimental ophthalmic clinic of the Institute of Experimental Medicine and in the Hirshman Memorial Central Ophthalmic Institute.

The volume is suitable for use in English-speaking countries or in Russia, since the preface and the careful explanation of the principles and application of the tests are printed in both languages.

Dr. Rabkin, who is well known to many American colleagues since his visits to the United States, is to be congratulated on the effectiveness of design of these plates, the printing of which has been most efficiently exe-

cuted by the Ukrainian Medical Publishing Board and the Kharkof Polygraphic Institute. W. H. Crisp.

CORRESPONDENCE

Quackery in ophthalmology

August 14, 1936

Editor,

American Journal of Ophthalmology:

Dr. Crisp's editorial in the August, 1936 issue of your Journal touches on a very important subject of quackery in ophthalmology. The editorial does not give an answer to the question why the quacks are successful in fooling the people. It is not enough to say that the people in general are credulous and respond easily to promises that cannot be fulfilled and that are given for pecuniary reasons. Many patients are convinced that the quacks have been their benefactors, that through exercises they have learned to dispense with glasses which have been worn for years. There must be a serious reason for the spread of quackery and for the belief of some patients that exercises may make superfluous the wearing of glasses.

I have already written in my letter on "Refraction in Europe and America" published in the April, 1936 issue of your Journal that thousands of people in America are wearing glasses un-

necessarily. This is caused by standardization, lack of individual approach, and overestimation of trifles which have little practical value. Particularly is it true in regard to the large number of optometrists who test refraction and often call themselves "eyesight specialists." In cases of hyperopia, slight myopia, and slight astigmatism *many* can get along pretty well without glasses.

If a patient who has unnecessarily worn glasses for years comes to a quack, he pays for the exercises and soon parts with the glasses. It does not occur to the patient that he never needed glasses or that he could get along without them. He knows that he was advised by "specialists" to wear them constantly. He tells his friends to go to the quack to learn how to dispense with glasses. The fame of the quacks spreads, and people flock to their offices expecting a marvelous cure. Here lies the foundation of the quack's success.

If prescription of glasses were the privilege of the physician only, and if instead of standardization, discrimination were accepted, the quack would be unable to fool the people, the patient would not believe in quackery, and prescription of glasses would be based on a sound foundation.

(Signed)

O. R. Lourie.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

- | | |
|--|--|
| 1. General methods of diagnosis | 10. Retina and vitreous |
| 2. Therapeutics and operations | 11. Optic nerve and toxic amblyopias |
| 3. Physiologic optics, refraction, and color vision | 12. Visual tracts and centers |
| 4. Ocular movements | 13. Eyeball and orbit |
| 5. Conjunctiva | 14. Eyelids and lacrimal apparatus |
| 6. Cornea and sclera | 15. Tumors |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 16. Injuries |
| 8. Glaucoma and ocular tension | 17. Systemic diseases and parasites |
| 9. Crystalline lens | 18. Hygiene, sociology, education, history |
| | 19. Anatomy, embryology, and comparative ophthalmology |

1

GENERAL METHODS OF DIAGNOSIS

Bichelonne, Favory, and Bégué. The use of selective yellow light in ophthalmology. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 3-7.

The use of cadmium sulphide glass which transmits the red, yellow, and green rays of the spectrum has been of value in automobile headlights. It reduces glare and retinal fatigue, and increases visibility in fog. The authors determined that visual acuity and ease of reading were increased with use of this light. Ophthalmoscopy was facilitated because of absence of glare and reduced tendency for the pupil to contract.

P. J. Leinfelder.

Caramazza, Filippo. Results of biologic test, by Ninni's method, of aqueous or vitreous taken from rabbit eyes which had been inoculated with emulsion of tuberculous processes from human tubercle bacilli. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 417-430.

This biologic test of rabbit eyes inoculated with emulsion of tuberculous peritracheal gland of the guinea pig, infected with human tubercle bacilli, was negative if done between inoculation and the beginning of the tuber-

culous process in the eye, whereas it was positive if done when the tuberculous eye lesion was well developed.

M. Lombardo.

Castroviejo, Ramon. An illuminating device to be used as an attachment to the binocular corneal microscope for gonioscopy and goniophotography. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 786-789.

Horner, W. D. A special clamp for holding lid sutures in cataract operations. *Trans. Pacific Coast Oto-Ophth. Soc.*, 1935, 23rd annual meeting, pp. 149-151. (See *Amer. Jour. Ophth.*, 1935, v. 18, Oct., p. 957.)

Litinskii, G. A. Stereomyograph and apparatus for determination of depth perception and muscle balance. *Soviet-skii Viestnik Ophth.*, 1936, v. 8, pt. 6, p. 804.

A detailed description of this apparatus, which permits study of depth perception, muscle balance, accommodation, convergence, visual acuity for near, size of pupils under standard illumination, interpupillary distance, and range of ocular movements. (Illustrations.)

Ray K. Daily.

Pergola, A. **Ocular changes in mechanical asphyxia (experimental studies).** *Lettura Oft.*, 1936, v. 13, March, p. 83.

Pathological changes in the ocular tissues of animals killed by hanging, and by strangling with hand and with cord, were studied and are reported as a contribution to legal medicine. In all three types pronounced stasis and vasodilatation were found in the uveal tract except the iris; more marked in those dead from strangling and by hanging. Bloody extravasations into the choroid were present in those hanged and those strangled with the hand.

In the strangled animals particular mention was made of the formation of vacuoles in the peripheral strata of the lens. In all three types the optic nerve showed edema especially in the inter-fascicular tissues of the retrobulbar portion. Nothing of note was observed in the retina.

The author considers these constant and characteristic findings pathognomonic and presents them as auxiliary symptoms which when added to other data permit a differential diagnosis as to these various types of death.

F. M. Crage.

Schoenberg, Mark J. **A new model of an enophthalmometer and exophthalmometer.** *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 399-401.

The author presents a model which overcomes some of the disadvantages of the Hertel instrument. The head is immobilized with chin rest and head rest and by means of a visor device the determination of the line tangential with the corneal apex is easily made. This method insures more accurate measurements of small degrees of exophthalmos and enophthalmos.

C. Allen Dickey.

Schupfer, Francesco. **Perdrau-Ghigi's method modified by Scapaticci for reticular connective tissue.** *Boll. d'Ocul.*, 1936, v. 15, May, pp. 598-601.

A description is given of this method of silver impregnation. Its advantages

are the easy technique and almost constantly good results. (Bibliography, 3 figures.)
M. Lombardo.

Shapira, T. M., and Crage, F. M. **Pupillary variability in 108 syphilitic patients.** *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 891-893.

Srinivasan, E. C. **A few slitlamp observations.** *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 214-217.

The findings deal with some common affections, including superficial punctate keratitis and iritis, with differentiation from spring catarrh and leprosy. After noting the frequency of lenticular opacities in young myopes, the author suggests this as the original cause of progressive myopia through change of lens index of refraction affecting the accommodation.

Lawrence G. Dunlap.

Walker, J. P. S. **A portable scotometer.** *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 466-467.

The portable projection scotometer devised by the author folds into a case, and is useful in homes as well as for office practice. Bulbs and battery of the ordinary pocket size are satisfactory for use. The advantage of the projection scotometer is that the patient's attention is not diverted by the operator's hand or by the mechanism, as the instrument is behind the patient. (1 Illustration.)
D. F. Harbridge.

Wilenskin, M. **A diaphragm for the electric ophthalmoscope of Dr. H. Wolff.** *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 820.

To reduce the large field of illumination, which makes examination of the macula through small pupils difficult or impossible, the author recommends a diaphragm over the condenser.

C. Zimmerman.

2

THERAPEUTICS AND OPERATIONS

Burky, E. L. **Studies on the action of staphylococcus toxin and antitoxin**

with special reference to ophthalmology. *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 841-851.

Fiore, Tito. Action of optochin, fluorescein, and optochin fluoresceinate on the metabolism of the pneumococcus. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 607-611.

The writer gives in a tabulated form the results of his experiments in regard to the use of oxygen and the production of the hydrogen peroxide on the part of pneumococci either alone or in the presence of optochin, fluorescein, or fluoresceinate of optochin. He comes to the conclusion that optochin is a strong inhibitor of aerobic oxidations produced by the germs. Fluorescein in the dark helps oxidation of the bacterium and in the light stops it. The author discusses the therapeutic activity of optochin and its action on dehydrogenetic enzymes of the pneumococcus. (Bibliography.) M. Lombardo.

Guha, G. S. The role of vitamins in ocular affections. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 82-85.

The author used vitamin A with fine results in such eye disorders as low myopia, asthenopia, mild ptosis, and transient mild episcleritis.

Lawrence G. Dunlap.

Hanumantha Rao, M. V. Modern methods of general anesthesia in ophthalmic practice. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 238-242.

Evipal (sodium evipan), when intravenous injections can be made, is most satisfactory, especially when a retrobulbar injection is used as adjuvant in painful operations such as iridectomy for secondary glaucoma. One patient sneezed for nearly an hour after the anesthetic was injected, and no operation could be done. Another sobbed for a half hour, another yawned fifteen minutes, while still another vomited once; but 22 other cases were satisfactory. A six-year-old child vomited twenty times in twenty-four hours after removal of a membranous cataract through a keratome incision under

chloroform anesthesia. A small iris prolapse was replaced under avertin anesthesia. Avertin is recommended for operations in highly excitable children, especially those of one to six years.

Lawrence G. Dunlap.

Hesky, Mario. Hemostatic clamp for canthotomy. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 679-682.

The author describes and illustrates a clamp by which a bloodless field is obtained in canthotomy. The advantages are ease of application after the incision at the canthus, controllable pressure on the cut structures, and absence of incumbrance in the operative field. (3 figures.) M. Lombardo.

Hill, E., and Courtney, R. H. A critical summary of surgical experiences in 1934. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 773-779.

Merkulov, I. I. The action of X rays and radium on the eye. *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 6, p. 836.

A review of the literature and a report of the effect of radium and X rays on fifteen eyes irradiated because of intraorbital tumors. One of the orbits treated by X rays was finally exenterated and microscopic sections of the eyeball demonstrated the pathologic changes caused by an overdose of X rays. In one case treated with radium there was late development of cataract and in two kerato-iritis. A normal eye tolerates one hundred percent of the erythema dose; but an inflamed eye is more sensitive and the dosage should be reduced by 15 or 20 percent. Repeated doses may be as large provided there is a two or three months interval between irradiations. Excessive and too frequent doses of X rays and radium produce kerato-conjunctivitis, iridocyclitis, cataract, and telangiectasis of the conjunctival and scleral vessels. A safe radium dose is two hundred milligram hours. For most diseases the therapeutic doses of X rays and radium are far below the erythema dose and are therefore absolutely harmless.

Ray K. Daily.

Nastri, F. Effects on the eye of local application of extracts of the posterior lobe of the hypophysis. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 612-626.

Posterior-lobe extract has a hemostatic and mydriatic action and lowers intraocular pressure. In combination with a solution of novocaine it increases anesthetic power and mydriatic action. (Bibliography.)

M. Lombardo.

Refatullah, M. The role of anesthesia in ophthalmology. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 226-237.

The author discusses the local anesthetics used in the Eye Infirmary, Medical College Hospitals, Calcutta. Pantocain, preferred for tonometry and removal of foreign bodies causes too much hemorrhage for conjunctival or bulbar surgery. O'Brien's akinesia by blocking over the condyle of the lower jaw is highly praised. General anesthetics used are chloroform, ether, and "ACE." Evipal (sodium evipan) has been used in one hundred operations, including paracentesis, enucleation, evisceration, cataract, trephine, iridectomy with acute secondary glaucoma, exenteration of orbital growth, and squint, with no untoward results. The only contraindications to its use are liver disease and low blood pressure.

Lawrence G. Dunlap.

Sen, K. Asepsis of the conjunctival sac in intraocular operations. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 223-225.

The author continues a report previously published (see *Amer. Jour. Ophth.*, 1935, v. 18, p. 977). Of four eyes lost by panophthalmitis, three were due to *B. pyocyaneus* infection and one to *staphylococcus aureus*. One *pyocyaneus* infection was traced to the patient's ear and the other two to septic surgical cases near by. The *aureus* infection was traced to the other conjunctival sac of the patient. Even a conjunctival sac from which an eye had been removed was a source of infection to the fellow eye until the socket was filled with ointment and securely ban-

daged. Now, irrespective of the eye to be operated upon, both eyes are treated in the usual way. The operation is not postponed when a growth of *staphylococcus* is found.

Lawrence G. Dunlap.

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Adler, F. H., and Meyer, G. P. The mechanism of the fovea. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 266-280.

By an ingenious series of experiments in which the effects of various factors have been independently analyzed, the authors find the "physiologic fovea" to be approximately 0.25 mm. in diameter. Within this area the sensitivity is the same and the acuity depends upon length of exposure. The limits of acuity are not determined by size of individual receptors, and low thresholds can best be explained on the basis of summation.

David O. Harrington.

Bogoslovskii, A. I. Conditioned reflex changes in fusion frequency of central and peripheral vision. *Sovietskii Viestnik Opt.*, 1936, v. 8, pt. 6, p. 795.

The criteria were lowered fusion frequency for peripheral vision and increased fusion frequency for central vision under the influence of sound. After a series of tests with sound which was always introduced at the same period of dark adaptation, similar results were obtained in tests at the same period of dark adaptation without the introduction of sound. The reflex thus conditioned by time lasted several days and wore off spontaneously. Since the cerebral cortex takes part in conditioned reflexes this field offers an opportunity for the study of the cerebral component in sensory activities. The experiments also point to the possibility of raising the visual activity under definite conditions.

Ray K. Daily.

Brandenburg, K. C. Aniseikonia. *California and Western Med.*, 1935, v. 43, Sept., p. 188.

Brandenburg, cites a typical case in which merely an exact refraction and glasses will not relieve all symptoms of strain and headache. He states that retinal images of an object are very frequently of different size and shape in both eyes and this must be taken into account and corrected.

Theodore M. Shapira.

Dowling, H. **An analysis of visual findings in subnormal individuals.** Jour. Michigan State Med. Soc., 1936, v. 35, March, p. 164.

The five tables presented show that visual findings in subnormals run closely parallel to those of normals.

Theodore M. Shapira.

Gellhorn, E. **The effect of O₂ lack, variations in the CO₂ constant of the inspired air, and hyperpnea on visual intensity discrimination.** Amer. Jour. Physiology, 1936, v. 115, May, p. 679.

Gellhorn states that O₂ lack, six per cent-CO₂-air mixtures, and hyperpnea produce a reversible decrease in visual intensity discrimination. Magnitude of change and duration of recovery depend on degree of O₂ lack. Excitability of auditory and visual apparatuses are influenced in a similar manner by hyperpnea, O₂ lack, and CO₂ excess.

Theodore M. Shapira.

Krauss, Stephen. **On some optical phenomena observed in light adaptation and related to the Purkinje phenomenon.** Folia Ophth. Orientalia, 1936, v. 2, April, p. 136.

The author describes the episcotister, a black rotating disc with a variable sector through which a shadow is thrown on the colors lying behind. When red and blue of exactly the same brightness are viewed through the episcotister, blue appears brighter than red. From this one may conclude that the Purkinje phenomenon is not dependent upon dark adaptation alone, but rather upon changes in the intervening optical medium, since it appears when an artificial veil is placed in front of the colors by the episcotister.

R. Grunfeld.

Kravkov, C. B. **The effect of auditory stimulation on light and color sensitivity.** Sovetskii Viestnik Ophth., 1936, v. 8, pt. 6, p. 787.

The thresholds of light and color perception were charted during forty minutes of dark adaptation, and then the auditory apparatus was stimulated for ten minutes by a sound from a generator; the thresholds of light and color perception were tested three times during the ten minutes. The resulting curves show that auditory stimuli diminish the light sensitivity of the eye. Sensitivity for color is increased for short waves and lowered for long waves. The maximum increase is in the region of 520-530 millimicra, and the maximum decrease in the region of 580-600 millimicra. It appears that sound stimulates perception for green and blue, and lowers perception for red. These findings call for revaluation of the visibility of red signals, under the influence of sound. Ray K. Daily.

Lo Cascio, G., and Friedmann, G. **The action of light on the amino-acid content of the retina.** Ann. di Ottal., 1936, v. 64, May, 289.

The author studied the amino-acid content of the retina under conditions of illumination and darkness and reached the conclusion that after the eye of the animal had been exposed to intense light for a period of several hours there was a smaller amount of amino acid in the retina than found in animals kept in darkness. The diminution is probably due to the well known phenomenon of photolysis of the amino acid. (Bibliography.) Park Lewis.

Podestà, H. **Contribution to the question of delimiting congenital disturbances of color sense, especially total color blindness.** Klin. M. f. Augenh., 1936, v. 96, June, p. 786.

Podestà suggests distinguishing simple, uncomplicated, or true total color blindness from total color blindness accompanied by poor vision, photophobia, and nystagmus, with simple regressive heredity, more regular distribution between the sexes, and frequent blood re-

lationship. The latter may rest upon pathological changes in the visual tract. For discrimination a greater consideration of the different hereditary types of both forms seems most important. The heredity common to both forms suggests the question whether eugenic measures should be adopted to prevent hereditary transmission of total color blindness. C. Zimmermann.

Rodriguez, B., and Raffo, L. A. **Bilateral ophthalmoplegia (paralysis of third pair) consecutive to lethargic encephalitis.** *Rev. de Ophth. de São Paulo*, 1936, v. 4, May, pp. 420-434.

A man of 19 years who a year and a half ago had a severe lethargic encephalitis has shown persistent paralyses involving all the muscles innervated by the motor oculi (bilateral external and internal ophthalmoplegia). The general subject of paralysis of the motor oculi is discussed at considerable length, and an extensive bibliography is added. W. H. Crisp.

Vito, Pietro. **The properties of the curves showing the behavior of visual acuity along the principal meridians of the retina.** *Ann. di Ottal.*, 1936, v. 64, May, p. 341.

The author has studied the retinal curves corresponding to the visual acuity in the principal meridians of the eye. While the equations cannot be determined exactly the approximations are sufficient to warrant the conclusion that the visual-acuity curve of each half of the horizon meridian takes a parabolic form while each half of the vertical curve is more nearly hyperbolic. (Bibliography.) Park Lewis.

Williamson-Noble, F. A. **A modification of bifocals.** *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 464-465.

Wearers of bifocals complain frequently of difficulty in stepping down from curbs and so on. In the lens here described, the distance and reading centers coincide, eliminating the seeming movement of an object when the wearer looks down. (2 illustrations.) D. F. Harbridge.

4

OCULAR MOVEMENTS

Agnello, Francesco. **A case of congenital bilateral paralysis of the abducens.** *Riv. Oto-Neuro-Oft.*, 1936, v. 13, Jan.-Feb., pp. 53-65.

A woman of 64 years, a congenital luetic, with high myopia but 9/10 vision upon correction, showed normal primary position, normal convergence, and normal elevation and depression, but on looking right the right eye and on looking left the left eye stopped at the median line, whereas each eye had normal adduction. No diplopia was demonstrable. The writer considers the defect of nuclear origin, perhaps due to luetic destruction of the sixth nuclei in fetal life. (Bibliography, 3 figures.) M. Lombardo.

Alabaster, E. B. **Remarks on the physiology of convergent concomitant strabismus.** *Trans. Ophth. Soc. United Kingdom*, 1935, v. 55, p. 321.

The author had always been impressed by the association of concomitant squint with an unstable nervous system. Binocular field examinations were made in normal cases and in muscle paralyses and concomitant squints. In the normals there was fusion of colors in all parts of the fields, the unpaired portion of the field perceiving color of the respective side. In paralytic cases with diplopia an ever-changing patchwork was formed by the two colors, while in concomitants one color only was seen in the central portion, that being the color received by the fixing eye.

The author concludes that it is extremely unlikely that a false macula will develop in the portion of the eye that is not being used but that in concomitant cases projection is accurate in the portion of the squinting eye which is being used. Beulah Cushman.

Balduzzi, Ottorino. **The optokinetic nystagmus in mesencephalic lesions.** *Riv. Oto-Neuro-Oft.*, 1936, v. 13, March-April, pp. 165-179.

A woman of 21 years, another of 32, and a girl of 13 were affected respec-

tively with pontine-peduncular glioblastoma, meningioma of the pons, and right temporo-mesencephalic cystic glioma. Ocular symptoms included nystagmiform movements in the extreme lateral rotation. The corresponding general and focal nervous symptoms showed disappearance of normal optokinetic nystagmus. Absence of optic nystagmus is an early symptom of conjugate oculomotor changes and an important part of the mesencephalic syndrome, especially in cases in which signs of oculogyral function are still present. Bibliography, 3 figures.)

M. Lombardo.

Clark, C. P. Paralysis of divergence of functional origin. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 789-791.

Mowrer, O., Ruch, T., and Miller, N. The corneo-retinal potential difference as the basis of the galvanometric method of recording eye movements. *Amer. Jour. Physiology*, 1936, v. 114, Jan., p. 423.

Seeking to confirm the experiments of Meyers and Jacobson, the authors conclude that (1) the observed polarity of the galvanometric effects associated with eye movements fulfills the expectations arising from the corneo-retinal potential difference hypothesis and not those arising from the action-current hypothesis; (2) passive movements of the eyes produce galvanometric deflections strictly comparable in magnitude and polarity to those produced by active voluntary eye movements; (3) movements of the eyes are accompanied by virtually no galvanometric effects after the retina is destroyed by chemical means; (4) the existence of the corneo-retinal potential difference has been directly demonstrated by earlier investigators.

Theodore M. Shapira.

O'Connor, R. P. Surgical correction of pure convergence insufficiency. *Trans. Pacific Coast Oto-Ophth. Soc.*, 1935, 23rd annual meeting, p. 50. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 354.)

Ohm, J. A peculiar optokinetic reaction in a case of hole in the macula. *Zeit. f. Augenh.*, 1936, v. 89, Aug., p. 327.

On some nystagmograms taken in the hope of determining objectively the visual loss in a suspected malingerer, Ohm noted a difference in amplitude and energy of optokinetic nystagmoid oscillations which depended on which eye was stimulated and the direction of revolution of the striped drum. Explanation was found in the fact that a slight congenital nystagmus which had been missed on first examination summated with the optokinetic nystagmus and produced neutralization in one direction and doubling in the other. Incidentally, it was found that a small macular hole did not decrease optokinetic nystagmus.

F. Herbert Haessler.

Verhoeff, F. H. A kinetic test for stereoscopic vision. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, p. 127. (See *Amer. Jour. Ophth.*, 1936, v. 19, Oct., p. 914.)

Zachariah, G. A case of ophthalmic migraine involving the sixth nerve. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 211-213.

This is a case report of a left external rectus paralysis, following a head cold and sore throat of the previous week. The diplopia lasted six days and disappeared under treatment with potassium iodide and sodium salicylate. Headache and pain were the only migrainous symptoms.

Lawrence G. Dunlap.

5

CONJUNCTIVA

Anastasi, Giovanni. Lymphoma of the conjunctiva. *Ann. di Ottal.*, 1936, v. 64, May, p. 310.

The author reviews recorded cases. He adds a study of three cases which came under his own observation. His conclusions are that conjunctival lymphoma is a definite entity both clinically and histologically, that it is a benign tumor, that it cannot always be differentiated clinically from other con-

junctival neoplasias but that the histologic picture is invariable. The treatment is surgical when the new growth is situated at the plica semilunaris, but elsewhere roentgen therapy is effective. (3 plates, bibliography.) Park Lewis.

Apetz, W. Argidal in ophthalmology. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 73.

Argidal is a five-percent solution of acetyl salicylate of hexamethyltetramin silver (0.2-percent silver). For a year Apetz used it in 1.5-percent solutions for conjunctival and lacrimal inflammations, with good results. It is less painful than nitrate of silver. In diplobacillary conjunctivitis zinc solutions were better. C. Zimmermann.

Ascher, K. W. Massage in the treatment of trachoma. *Zeit. f. Augenh.*, 1936, v. 89, Aug., p. 336.

Because the glass rods used in massage of the conjunctiva of trachoma occasionally break, Ascher procured a silver rod 8 cm. long with a 9 mm. highly polished sphere at one end and a slightly rough one at the other. The rough end is used for rather granular conjunctiva. The author tentatively ascribes the satisfactory results of treatment to specific oligodynamic action of the metal. He suggests trying other metals, for example copper and gold. F. Herbert Haessler.

Banerji, N. C. Spring catarrh in Bengal. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 100-105.

Spring catarrh is very common in Bengal, occurring at any time of year. The author states that 51 percent of the patients are less than 15 years and only 4 percent over 25 years of age; that 80 percent are males; and that 72 percent are of the palpebral type, 12 percent bulbar, and 16 percent mixed. He mentions doubtful results following surgical treatment, autohemotherapy, splenic extract, arsenic calcium, ultraviolet rays, lactic acid, or chaulmoogra oil. Beside astringents, Crookes lenses, and general tonic measures, radium is often effective.

Lawrence G. Dunlap.

Desai, H. M. Notes on subconjunctival injection of guaiacol cacodylate in phlyctenular keratoconjunctivitis. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 132-133.

Where phlyctenular disease of the conjunctiva and cornea does not respond to ordinary methods of treatment, including tuberculin, the author has treated several thousand cases in the past eighteen years in patients with a scrofulous diathesis by cocainizing the eye and injecting five to ten minims of two percent aqueous solution of guaiacol cacodylate subconjunctivally as near the phlycten as possible. After-pain is slight, lasting one-half to two hours, and marked relief of symptoms occurs in 24 hours. The injection must not be repeated earlier than the fourth day. Cases of moderate severity require about two injections, while severe cases may require five or six injections. Lawrence G. Dunlap.

Duraiswami, T. S. A case of conjunctival inflammation—diphtheric? *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 110-114.

A 28-year-old psychoneurotic single female was finally thought guilty of placing foreign bodies in her left upper fornix. Lawrence G. Dunlap.

Frogé, P., and Chiniara, J. Consideration on edema of the ocular limbus due to sunlight. *Folia Ophth. Orientalia*, 1936, v. 2, April, p. 131.

Vernal catarrh appears in three forms of intensities: (1) strong vascularization at the limbus in the interpalpebral area; (2) an edematous pad impinging on the limbus; (3) greyish infiltration of the limbus with vascularization and white dots. Clinical observation and animal experimentation lead the authors to hold the action of sunlight on a specially sensitive organ to be the main etiologic factor, but they are unable to indicate the mechanism involved or to establish the part played by porphyrin in these photosensitive persons. R. Grunfeld.

Frogé, P., and Poursines, Y. Contribution to examination of the trachoma-

tous palpebral conjunctiva with the corneal microscope. *Folio Ophth. Orientalia*, 1935, v. 2, Nov., p. 43.

This report is preliminary to a more comprehensive study in which the authors attempt to correlate the slitlamp findings on the conjunctiva with the clinical appearances of trachoma in regard to the second and third stages of MacCallan. R. Grunfeld.

Gifford, S. R., and Lazar, N. K. Inclusion bodies in ophthalmia neonatorum. Further note. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, p. 382. (See *Amer. Jour. Ophth.*, 1936, v. 19, Jan., p. 61.)

Kattan, M. A. El. Leishmaniasis of the eyelids and conjunctiva in Egypt. *Bull. Ophth. Soc. Egypt*, 1935, v. 28, p. 12. (See Section 14, Eyelids and lacrimal apparatus.)

Narayanaswami Pillai, V. Tuberculous ulceration of the conjunctiva. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 106-109.

A case of lupoid keratoconjunctivitis of several years duration in a Hindu male aged twenty years was treated with iodoform locally, cod liver oil, good diet, tubercle bacillary emulsion. Healing resulted in four months. Only five cases of tuberculosis of the conjunctiva have been seen in fifteen years among a quarter of a million new patients. Lawrence G. Dunlap.

Onisi, Yosiharu. On Prowazek bodies in laboratory sections; with observations on geographic statistics as to the occurrence of Prowazek bodies. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 797.

For five years Onisi carefully examined smears and sections from 1,448 cases of trachoma in Northern Japan. He found Prowazek's bodies 54 times (63.73 percent). This percentage is lower than in other parts of Japan. The climate of northern Japan throughout the year is colder than that of southern Japan. Hence the author is inclined to surmise that etiologic relations exist between the colder climate and the lower percentage of Prowazek bodies. Where

Prowazek bodies were found, intense papillary exuberations of the conjunctiva were almost always present clinically. C. Zimmermann.

Rangachari, V. A case of unilateral trachoma. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 97-99.

A fourteen-year-old boy presented himself with a typical follicular and papillary trachoma of the left palpebral conjunctiva and fornices without involvement of the bulbar conjunctiva or cornea and with the fellow eye normal. Two percent AgNO₃ and beta-radium rays locally with calcium gluconate, cod-liver oil and tuberculin B. E. effected a cure. Lawrence G. Dunlap.

Reese, F. M. Meningococcus conjunctivitis followed by septicemia and beginning meningitis. *Amer. Jour. Ophth.*, 1936, v. 19, Sept., pp. 780-782.

Satyanatham Pillai, A. Leptothricosis conjunctivae and the Parinaud's syndrome. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 115-117.

The paper presented concerns itself with the question of diagnosis of Parinaud's conjunctivitis and gives a single typical case in a twenty-year-old married Hindu female.

Lawrence G. Dunlap.

Towbin, B. G., and Tkatschow, W. P. On the X-ray treatment of trachoma and follicular conjunctivitis. *Folia Ophth. Orientalia*, 1935, v. 2, Nov., p. 46.

The authors investigated the general effect of X-ray radiation on the course of trachoma. They radiated different parts of the body, the thigh, the spleen, or the back, but excluding the eyes. A single 60 percent skin-erythema dose was used in folliculitis, and four such doses in trachoma at one to two weeks intervals. Good subjective and objective results were achieved in folliculitis. Among the trachomatous patients only few improved, the majority remained unimproved. After radiation a focal reaction in the eyelid was repeatedly observed. R. Grunfeld.

Trapezontzeva, E. Comments on Kolenko and Tarasova's article on "The Wassermann reaction in trachoma." *Sovietskii Viestnik Ophth.*, 1936, v. 8, pt. 5, p. 748.

On the basis of personal experience, the author attributes to faulty technique the frequency of positive Wassermann reactions in trachoma reported by Kolenko and Tarasova.

Ray K. Daily.

Uchida, Yuzo. On ocular disturbances due to intoxication with aspirin. *Folia Ophth. Orientalia*, 1935, v. 2, Nov., p. 38.

Two patients, apparently because of aspirin idiosyncrasy, developed ophthalmia with marked swelling of the eyelids, conjunctival injection, lacrimation, and photophobia; to which in one case bullous keratitis was added. A skin eruption occurred at the same time. In each case a cold and albuminuria were present. Weakened resistance and temporary renal disturbance probably contributed to the drug idiosyncrasy.

R. Grunfeld.

Vito, P. Conjunctivitis from verruca of the free lid margin. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 627-634.

Three patients, 48, 41, and 21 years old respectively, were relieved of follicular or other acute inflammatory conjunctival symptoms after the extirpation of verruca of the lid. In one of two other persons instillation of a suspension of the triturated verruca in the conjunctival sac provoked an intense reaction which lasted for some time. The author thinks that this patient was sensitized to the virus of the verruca, and that these cases belong to the class of allergic conjunctivitis. (*Bibliography.*)

M. Lombardo.

6

CORNEA AND SCLERA

Barman, K. P. Tuberculin and ultraviolet therapy in certain affections of the cornea. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 218-222.

The author gives five case reports of conditions diagnosed as tuberculous

keratitis because of positive tuberculin reaction, extreme chronicity and resistance, resemblance to phlyctenular keratitis, and failure to find a second presumable cause. Ultraviolet light activates ergosterol to vitamin D, increases blood calcium and phosphorus, and increases the immunologic and bactericidal properties of the blood.

Lawrence G. Dunlap.

Biswas, P. K. Groenouw's disease. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 126-131.

Nodular corneal opacity, first described by Groenouw in 1890, consists of numerous small rounded or crenated greyish non-confluent opacities in the otherwise clear corneal tissue. Familial corneal dystrophy, nodular keratitis, and lattice-shaped or grill-like opacity are other names which have been used. The lesions are a dominant inherited characteristic, congenital, and have been followed through three generations in several series of cases. The author reports three more cases. Two Hindu children, a brother aged fifteen and a sister aged eleven years, were seen with bilateral involvement, vision of about 0.1, seven years duration, clear corneal periphery, other media and fundi normal, slightly insensitive cornea and negative tuberculin test. Repeated scraping of the cornea did not improve the vision, but did demonstrate hyaline degeneration of the corneal epithelium. The etiology is still unknown, but may be (a) a hereditary form of degeneration of the superficial lamellae of the cornea, (b) neurotrophic, (c) tuberculous.

Lawrence G. Dunlap.

Borsotti, Ippolito. Contribution to the knowledge of behavior of the reticulo-endothelium in repair of aseptic non-perforating wounds of the cornea. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 635-648.

The histologic examination of rabbit eyes, enucleated at different stages after a non-perforating wound of the cornea had been provoked and vital coloring used by injection, demonstrated that colored reticulo-endothelial elements

migrated from the limbus to the seat of the corneal wound in the period of repair. (Bibliography, one figure.)

M. Lombardo.

Davidson, M. *Silicosis corneae*. Amer. Jour. Ophth., 1936, v. 19, Oct. p. 896.

De-Petri, M. *Contribution to the therapy of keratohypopyon*. Boll. d'Ocul., 1936, v. 15, June, pp. 658-678.

Nineteen cases of ulcer of the cornea, either simple or with hypopyon, eleven complicated by dacryocystitis, were treated with the electrocautery at low temperature, together with extirpation of the lacrimal sac in complicated cases. One cauterization gave immediate and satisfactory results in superficial ulcers, while two or more cauterizations were necessary in deep ones. There was no advantage over other treatments in corneal abscess or in very deep ulcer. Frequently cauterization is followed by iritis with obstinate miosis. (Bibliography.)

M. Lombardo.

Feigenbaum, Aryeh. *On typical and atypical episcleritis metastatica furunculiformis and their relations to rheumatic episcleritis and to erythema nodosum*. Folia Ophth. Orientalia, 1935, v. 2, Nov., p. 27.

Three cases are described in each of which a furuncle was present or the patient gave a history of furunculosis. In the typical case the episcleritic focus suppurated, while in the two atypical cases furunculiform foci appeared alternately with nonsuppurating episcleritic foci in the same eye. In a fourth patient a very obstinately recurrent episcleritis and keratitis appeared with an abortive form of erythema nodosum, the etiology of which was possibly tuberculous. The episcleritic nodules are of metastatic origin and are equivalent to the efflorescences found on the skin in erythema nodosum, and in rheumatoids and tuberculids originating from a common focus of infection.

R. Grunfeld.

Filatow, W. P. *The Filatow-Marzinkowsky trephines for corneal transplan-*

tation. Klin. M. f. Augenh., 1936, v. 96, June, p. 756.

To avoid injury of the lens, prolapse of vitreous, and premature escape of aqueous, Filatow constructed various trephines which are described and illustrated.

C. Zimmermann.

Fiore, Tito. *Some rare cases of keratoconus complicated with senile cataract and chronic simple glaucoma*. Boll. d'Ocul., 1936, v. 15, April, pp. 482-491.

The author gives the history of two old ladies, aged 63 and 72 years respectively, affected by bilateral keratoconus and cataract, and of a man affected by simple glaucoma. The cataracts were operated on with success. (Bibliography.)

M. Lombardo.

Franceschetti, A., and Kiewe, P. *A new indication for partial, non-penetrating keratoplasty: familial hereditary corneal degeneration*. Schweiz. med. Woch., 1936, no. 22, May 30, p. 528.

The authors describe a case, the sixth member in three generations, of familial corneal degeneration in a patient 38 years old in whom bilateral keratoplasty was done. Vision before operation was 4/50 in the right eye and 3/40 in the left eye. Vision in the right eye ten months after operation was 5/7.5 with a -3.00 sphere. Vision in the left eye seven months after operation was 5/10 with -4.00 sphere. The corneal grafts were obtained from freshly enucleated globes.

Theodore M. Shapira.

Friede, Reinhard. *Full-thickness keratoplasty in total corneal dystrophy*. Zeit. f. Augenh., 1936, v. 89, Aug., p. 332.

Friede attempted full-thickness keratoplasty in three cases of total corneal dystrophy, and feels that his results do not justify the absolute pessimism reflected in the literature. In one patient, a modest improvement in visual acuity to 1/36 was gratefully adjudged a success by the patient. The second patient had retained a relatively clear cornea during the eight months since operation, with visual acuity of 6/24. In the

third patient the author attempted to graft an entire cornea. It remained clear for ten days but became entirely opaque when its lower edge was torn out during removal of sutures. However, the author believes that this corneal graft, though opaque, is a healthier substratum for a new and smaller graft.

F. Herbert Haessler.

Holley, S. W. Corneal reactions in tuberculin tests. *Amer. Jour. Pathology*, 1935, v. 11, Nov., p. 937.

Corneal reactions of normal and tuberculous guinea pigs to tuberculo-protein and tuberculo-phosphatid were studied for one month. Both substances had a toxic effect on the cornea of tuberculous animals, but not on the cornea of normal animals. This toxic effect was manifested by inflammation and degeneration of the corneal tissue. In the tuberculous cornea according to the author, most of the mononuclear cells at the site of the injection are from the blood stream, and the epithelioid cells originate from these monocytes.

Theodore M. Shapira.

Kayser, B. Histologic findings in true megalocornea globosa. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 721.

Supplementing his description of the external anatomic measurements (see *Amer. Jour. Ophth.*, 1933, v. 16, p. 1125), Kayser gives the histologic findings of the only such eyeball that came to autopsy. They definitely prove that glaucoma plays no part in the development of this type of megalocornea, and that there is a true uncomplicated megalocornea in which the changes are confined to the anterior segment of the eyeball, especially as regards the shape of the cornea and incidental changes at the sinus of the anterior chamber and ciliary body. The changes are not secondary to inflammation or degeneration. Hence it is necessary to distinguish this true megalocornea from the secondary form. It is a mere anomaly of development. Macrophthalmos and megalocornea are entirely different conditions, which have in common an enlarged cornea. (Illustrations.)

C. Zimmermann.

Kraupa, E. Conjunctival nodule in scleritis. *Zeit. f. Augenh.*, 1936, v. 89, Aug., p. 338.

The discovery of conjunctival nodules with tuberculous scleritis is usually credited to Axenfeld and Rupperecht, but Kraupa seeks to establish priority for Vossius by quoting six earlier references.

F. Herbert Haessler.

Löwenstein, Arnold. On lipid infiltration in man and experimental animals. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 765.

By giving rabbits cholesterin in the food, an arcus lipoides of the cornea was produced directly at the limbus, not separated from it by a clear zone as in the human type. As to a boy (whose prematurely senile father had a broad arcus senilis) with very marked arcus lipoides the history revealed that his diet had been rich in fat and albumen and he had taken cod liver oil up to his twelfth year. In three other cases with unusual arcus lipoides the diet had been rich in fat. Two further cases of arcus lipoides juvenilis and increased cholesterin content of the blood presented general vascular disturbances which may have been related to intense cholesterinemia. In rabbits overfed with cholesterin regeneration of the corneal epithelium was not diminished, but the cornea was less resistant to staphylococcic infection. Cholesterin infiltrations are described in the corneal scars of two functioning eyes, for whose treatment hyperemia and reduced lipid diet were recommended. The lipid metabolism of all individuals presenting abnormal lipid infiltrations in the cornea, especially arcus juvenilis, ought to be controlled, as early dietetic measures may perhaps favorably influence vascular affections and prevent premature senile changes, chiefly familial. (Illustrations.)

C. Zimmermann.

Maury, F. H. The pathology of lattice and nodular dystrophy of the cornea. *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 866-872.

Mukerjee, S. K. A case of blue sclerotics as a result of congenital syphilis.

Proc. All-India Ophth. Soc., 1935, v. 4, pp. 134-135.

Although blue scleras are rare in India, the author saw three cases in six months. Abnormal thinness of the sclera with defective deposition of calcium salts, and positive Wassermann and Kahn tests, was found in an eighteen-year-old Hindu girl and a younger and an older brother. Other signs of congenital syphilis were present.

Lawrence G. Dunlap.

Muthayya, R. E. S. Two cases showing a small superficial opaque white ring in the cornea. Proc. All-India Ophth. Soc., 1935, v. 4, pp. 122-123.

The described rings (not larger than 2 mm.) are composed of tiny round spots which are compared with drusen. One ring occurred in the cornea of a 55-year-old Hindu female with mature senile cataracts. No fundus study was made to determine the presence or absence of degenerative changes in the posterior segment. The ring consisted of a belt of little opaque white droplets at or about the level of Bowman's membrane, and it suggested lipoid degeneration. Another Hindu woman of about 55 years, while on the operating table for a cataract extraction, was found to have such a ring. The above condition, or Coats's ring, apparently differs from those described by Gradle in being permanent and from those described by Vogt in being made up of droplets instead of rod-shaped opacities.

Lawrence G. Dunlap.

Narayanaswami Nayudu, G. J. Keratomalacia. Proc. All-India Ophth. Soc., 1935, v. 4, pp. 68-75.

Half of this paper is bibliography on avitaminosis causing keratomalacia. It disagrees entirely with the contentions of English workers that keratomalacia cases are more susceptible to infections by pyogenic organisms than are other hospital patients.

Lawrence G. Dunlap.

Raja Iyer, D. Corneal opacities due to sugar of lead. Proc. All-India Ophth. Soc., 1935, v. 4, pp. 124-125.

Use of irritant remedies is one of the great causes of preventable blindness in South India. Lead incrustations are not uncommon. The usual sites for lesions due to irritant remedies are the lower part of the cornea and the lower cul-de-sac. Lead acetate and human milk treatment of a male Hindu aged 30 years produced opacities of a dense Chinese-white color with a porcelain-like quality, deposited not deeper than Bowman's membrane. Vision was reduced in 24 hours to fingers at 3 m. and hand movements respectively in the right and left eyes.

Lawrence G. Dunlap.

Rangachari, V. Buphthalmos and blue sclerotics. Proc. All-India Ophth. Soc., 1935, v. 4, pp. 136-138.

A Hindu boy aged thirteen years, the only atypical or unhealthy child of a family of seven, presented himself with blue sclerotics and a left buphthalmos. The left cornea measured 14 mm. (the right, 11 mm.), showed tears in Descemet's membrane, deep anterior chamber, and increased tension, with no vision. There was no lens dislocation or iridodonesis. Intracranial lesions should be searched for in such cases.

Lawrence G. Dunlap.

Rezende, Cyro de. Syphilitic gumma of the sclera. Rev. de Ophth. de São Paulo, 1936, v. 4, May, pp. 283-286.

The patient, a young man of eighteen years, had received 914 several months earlier on account of a primary lesion. No secondaries had been experienced. The ocular disturbance affected the vision, and appeared externally as a red elevation, about the size of a kidney bean, lying next to the cornea between the one and five o'clock positions. It was perfectly smooth and entirely covered by conjunctiva. After a positive Wassermann, further antisyphilitic treatment caused rapid improvement and cure.

W. H. Crisp.

Richman, Frances. Spontaneous rupture of the sclera (tuberculous). Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 792-794.

Rolett, D. M. Contact glass as a therapeutic agent in corneal ulcers. *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 888-890.

Rubino, A. A special form of bilateral corneal ectasia not before described. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 649-657.

After a facial trauma, both corneas of a man of 25 years changed shape so as to form an acute angle at the horizontal meridian. To the slitlamp the corneas appeared to be very thin along the angle and numerous striations reached this line. As cause the author accepts a dystrophic state of the cornea. (Bibliography, 3 figures.) M. Lombardo.

Satyanatham Pillai, A. Corneal ulcer due to fungus *glenspora graphii*. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 118-119.

After a second lacrimal-sac operation on a male Hindu aged 35 years for discharge of two years duration, a disturbed bandage still unchanged on the sixth day caused a corneal ulcer in the inferior nasal quadrant. The whole gamut of corneal ulcer therapy was applied to the patient and after two months the ulcer was definitely healing. The laboratory reported *glenspora graphii*. This is the second case ever reported of corneal ulcer due to this fungus. Lawrence G. Dunlap.

Viswalingam, A. A case of sclerosing keratitis profunda. *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 449-455.

The patient came in October, 1931, with sore eyes and photophobia, pupils active to light, anterior chamber slightly shallow, tension not raised, filtration angle crowded. The general health of the patient was good aside from "gravel" in the urine and a calculus passed some years previously. The condition in the left eye advanced until enucleation was necessary in November, 1935. Pathological, macroscopic, and microscopic reports of the globe revealed sclerosing keratitis profunda with secondary glaucoma. Seven drawings, and three photomicrographs.

D. F. Harbridge.

Wood, D. J. Inflammatory disease in the eye caused by gout. *Brit. Jour. Ophth.*, 1936, v. 20, Sept., pp. 510-519.

By means of four cases the author demonstrates the part seemingly played by gout as a cause or complication in certain eye diseases. The onset of the trouble was an attack of episcleritis fugax. In three cases tenonitis was present. Proof that gout is a principal cause is negative in part at least. The four cases demonstrate that effective treatment must be early and drastic and administered with the patient's coöperation. (7 photomicrographic illustrations.)

D. F. Harbridge.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Biozzi, Giuseppe. Contribution to histologic knowledge of Fuchs's heterochromia. *Boll. d'Ocul.*, 1936, v. 15, June, pp. 683-698.

In histologic examination of eight pieces of iris from eyes affected by Fuchs's heterochromia, the writer found constant inflammatory changes due to infiltration by lymphocytes and eosinophiles and migration of cellular elements to the surface of the stroma with formation of true efflorescences. In some cases there were fibrillary changes in the pars pupillaris, with slight vascular sclerosis and proliferation of adventitious elements. Regressive changes and involution of chromatophores, spots of atrophy of the sphincter, and cystoid degeneration of the pigment epithelium were also encountered. (Bibliography, 7 figures.)

M. Lombardo.

Brons, C. Cavernous angioma of the choroid. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 43.

Only eleven cases of hemangioma of the choroid have been accessible to ophthalmoscopic examination. A man of 41 years stated that the vision in his right eye had decreased for several weeks. A grayish opacity of 2-D. prominence extended from the optic disc to the macula, and over it coursed a blood

vessel with two branches. The surrounding retina was unchanged. Vision was 1/24. After three years the eye had become blind and showed detachment of the retina. Two years later it developed iritis with secondary hypertension and great pain, and was enucleated. Histologic examination revealed hemangioma of the choroid. Of the diagnostic points according to Mulock-Houwer, which are here discussed in detail, the simultaneous presence of nevi on the face and other parts of the body is undoubtedly the most important. (Illustrations.)

C. Zimmermann.

Brown, A. L. Experimental uveitis: "interference" effect of parenteral administration of proteins on sensitization of the uveal tract. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 435-450.

The anterior chambers of rabbits' eyes were injected with equal and unequal amounts of horse serum and egg white in order to observe the multiple sensitization and the production of "interference" reactions in relation to the quantity injected and the length of time following the injection. It was found that the large amount of protein inhibited ocular sensitization from a smaller amount of different protein injected later. Also, the quantity of the protein was more important than the time of injection. Typhoid vaccine was then used as the "interference" protein, and there was a decided reduction in intensity of the ocular reactions. Various methods, which included putting glycerin in the anterior chamber, and subconjunctival insertion of catgut soaked in the vaccine, were used to raise the aqueous typhoid-antibody titer in generally immune animals.

C. Allen Dickey.

Bücklers, Max. Curing sympathetic ophthalmia with atophanyl and cytotropin. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 725.

Ten cases of sympathetic ophthalmia are reported in detail. Eight could be considered completely cured by intravenous injections of atophanyl or cytotropin. Atophanyl is available in am-

poules of 10 c.c., each containing 0.5 atrophane-sodium and 0.5 salicylate of sodium. Cytotropin in an ampoule of 5 c.c. consists of 40 percent urotropin, 16 percent sodium salicylate, and 4 percent caffeine-sodium salicylate. The efficacy of these substances is still more marked in acute metastatic iritis, infections after perforating injuries, panophthalmitis, iritic glaucoma, and scleritis. They also have an anodyne influence.

C. Zimmermann.

Koman Nayar, K. Sympathetic ophthalmia. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 202-210.

Of the total number of hospital patients seen in the past fifteen years, fifteen, 0.003 percent, had sympathetic ophthalmia. Some cases followed penetrating injuries and others were post-operative. The condition is apparently mild, as well as rare, in India. Two post-traumatic and two post-operative cases were seen in the past year, presenting the classical uveal picture. In one case, in the anterior segment, there was only a mild uveitis, but there was severe choked disc surrounded by flame-shaped hemorrhages.

Lawrence G. Dunlap.

8

GLAUCOMA AND OCULAR TENSION

Bagchi, S. K. Importance of the study of field of vision on prognosis and treatment of epidemic dropsy glaucoma. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 172-175.

The author mentions the dropsy epidemics of 1926, 1927, 1929, 1930, and the most severe from the standpoint of eye complications, that of 1934. The province of Bengal was severely affected. One case with normal central vision and intraocular tension, field, and disc developed a tubular field of vision in three months while under observation. In another case the intraocular tension remained high (36 to 67 mm. Hg) for two months without any disturbance of the peripheral field. The author concludes that high tension is not in itself an indication for surgical intervention in the glaucoma of epi-

demic dropsy, that the nerve head can withstand pressure for a long time, that in this particular type of glaucoma medical treatment with miotics and saline purging are to be used so long as the field shows no contraction, and that intraocular pressure has no relation to systemic pressure.

Lawrence G. Dunlap.

Bencatarangam Nayudu, T. **Glaucoma, some clinical types.** Proc. All-India Ophth. Soc., 1935, v. 4, pp. 155-159.

The authors present a theory of an anterior and a posterior segment type of chronic primary glaucoma. They assume the posterior segment type to be due to increase of vitreous volume which gradually encroaches on the aqueous bed on the one hand, and the vascular bed on the other. In the anterior segment type, they believe that, although the same sort of vitreous swelling takes place, for some reason the aqueous can not escape at the angle.

Lawrence G. Dunlap.

Bhaduri, B. N. **Some uncommon ocular complications in epidemic dropsy.** Proc. All-India Ophth. Soc., 1935, v. 4, pp. 160-171.

After the first appearance of epidemic dropsy in Calcutta in 1877, thirty years elapsed before ocular manifestations were recognized. The one serious complication is glaucoma. Of the 15,500 new cases seen in the Carmichael Medical College Ophthalmic Out-patient Department, Calcutta, in 1934, two and five tenths percent were epidemic dropsy cases, and thirty percent of these showed ocular manifestations. Besides glaucoma, extraocular and intraocular hemorrhages are discussed at length, also "swelling of the optic disc." (Tables.)

Lawrence G. Dunlap.

Duke-Elder, S., Davson, H., and Benham, G. H. **The swelling pressure of normal and glaucomatous vitreous bodies.** Brit. Jour. Ophth., 1936, v. 20, Sept., pp. 520-527.

Basing their findings upon normal, dialyzed, KCNS-treated ox-vitreous

bodies; on a human glaucomatous vitreous, and on a vitreous from a freshly enucleated eye, the authors determine that the swelling pressure of the vitreous body cannot be the cause of chronic primary glaucoma. The results convince them that the swelling pressure is not of a degree to account for the raised tension. The principle of the apparatus is discussed and demonstrated, eliminating any valid objection to the method employed. (2 figures.)

D. F. Harbridge.

Dutt, S. C. **A short history of incidence of glaucoma in Bengal.** Proc. All-India Ophth. Soc., 1935, v. 4, pp. 176-183.

Cases of epidemic dropsy, or Bengal glaucoma, seen at the Calcutta Medical College Eye Infirmary in less than ten years numbered over 3,300, while in a like period at Moorfields hospital, London, 924 cases were seen. A correctly performed trephine operation gives immediate and permanent relief in nearly all cases. In the past ten years, ninety per cent or more of such cases were of the chronic simple variety. Epidemic dropsy apparently results from ingestion of a particular rice.

Lawrence G. Dunlap.

Meyer, K., and Palmer, J. W. **On the nature of the ocular fluids.** Amer. Jour. Ophth., 1936, v. 19, Oct., pp. 859-865.

9

CRYSTALLINE LENS

Ballantyne, A. J. **"Posterior needling" in the treatment of lamellar and other forms of soft cataract.** Brit. Jour. Ophth., 1936, v. 20, Sept., pp. 540-544.

The author presents illustrative cases of congenital and juvenile cataract. By this method there is no need for a general anesthetic. The patient may continue ambulant. The risk of retinal detachment is small compared with the real dangers incident to the anterior operation. D. F. Harbridge.

Barkan, H., Borley, W., Fine M., and Bettman, J. **Operative results in cataracts coincident with dinitrophenol**

therapy. *California and West. Med.*, 1936, v. 44, May, p. 360.

The authors present 24 cases operated upon and conclude that the prognosis is good for useful vision.

Theodore H. Shapira.

Chatterjee, N. Treatment of immature senile cataract. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 139-146.

The author is unalterably opposed to any method of cataract extraction other than the Smith intracapsular. He regards the patient as fit for operation as soon as he is unfit for his occupation, irrespective of the degree of lenticular degeneration. Medical treatment has no proved value.

Lawrence G. Dunlap.

Hahn, W. The treatment of cataract in history. *Jour. Med. Soc. New Jersey*, 1936, v. 33, Jan., p. 7.

Reviewing the treatment of cataract through the ages, Hahn does not believe that medical treatment for its removal will be successful.

Theodore M. Shapira.

Kraupa, E. Fire cataract. *Zeit. f. Augenh.*, 1936, v. 89, Aug., p. 337.

A historical note. Fire cataract is first mentioned by the surgeon, Heister, in his *Institutiones Chirurgicae* in 1739. This note has escaped historians like Hirschberg because it did not appear in the first edition.

F. Herbert Haessler.

Mohan Lal, A. Routine of cataract extraction as followed in the Mohan Eye Hospital, Aligarh. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 147-152.

Some Indian surgeons perform as many as fifty cataract extractions per hour. Desire for better results and fewer secondary cataracts caused the author to adopt the intracapsular method, using the Knapp-Stanculeanu-Török technique. In 250 cases he had only one case of iridocyclitis and three or four cases of iris prolapse. Morgagnian cataract is the only contraindication. The conjunctival flap incision is used, later putting in a single human-

hair suture, which is very soft and does not irritate the eye. After Kalt-capsule-forceps lens delivery, a Hess peripheral iridectomy is made. Preliminary preparation includes lacrimal syringing. One percent eserin follows the operation and the patient walks to bed.

Lawrence G. Dunlap.

Pereira, R. F. A statistical study of senile cataract operations at the Hospital Nacional de Clinicas eye service. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, May, p. 281.

For the last five years 410 senile cataract operations are recorded. Glaucoma as a complication appears more frequent in those without iridectomy, and among them iris prolapse is also more common. The intracapsular method seems to be giving ground to the extracapsular method in this five-year period. Occlusion of the eye is made more certain by a suture in the skin of the upper lid fastened with adhesive to the cheek. The author's modified Elschmig capsule forceps has the concavity backward in order to obscure the field of operation as little as possible.

M. Davidson.

Puscariu, E., and Nitzulescu, J. *Cataracta brunescens*—study of the nature of the coloring substance. *Brit. Jour. Ophth.*, 1936, v. 20, Sept., pp. 531-540.

Among 1,357 cases the authors found but four of the cataract type under discussion and only one of these with myopic eyes. The age range was 52 to 62 years. The only postoperative complication was a secondary pigmentary cataract. The vision, however, remained reduced. Two lenses from the fourth case were studied chemically, showing the pigment to be closely related to melanin. The same process of pigment accumulation is suggested as in brown atrophy of heart and muscles. (4 tables.)

D. F. Harbridge.

Rauh, Walter. *Lentiglobus anterior*. *Zeit. f. Augenh.*, 1936, v. 89, Aug., p. 321.

Rauh's patient was a 48-year-old man in whom this rare affection had

arisen when he was in his early forties. The author refers to thirteen other cases reported in the literature and points out that in three of these as well as his own a kidney lesion coëxisted. The cause of the lenticular change is still obscure. F. Herbert Haessler.

Rodin, F. H. **Cataracts following the use of dinitrophenol.** *California and West. Med.*, 1936, v. 44, April, p. 276.

Rodin reviews 32 cases of dinitrophenol cataract. The average age of the patients affected was 45 years. The youngest was 30, the oldest 67. The length of time that the drug was taken was three months to two years. In 27 patients cataracts appeared within fifteen months. The length of time the drug is taken is not a factor in the production of the lens opacities.

Theodore M. Shapira.

Rundles, W. **Dinitrophenol cataract.** *Jour. Michigan State Med. Soc.*, 1935, v. 34, Dec., p. 777.

Rundles reports a case of dinitrophenol cataract in a 48-year-old female who took the drug for reducing purposes. Theodore M. Shapira.

Shankara Menon, K. C. **Uncommon complications in cataract extraction.** *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 153-154.

Case one had expulsive hemorrhage of the anterior segment four days after uncomplicated extracapsular extraction with peripheral iridectomy and conjunctival flap. The conjunctival blood was cleared away. A month later the patient was discharged with a round pupil, clear vitreous, normal fundus and 6/36 vision. Case two was one of extracapsular cataract extraction. While irrigating the anterior chamber, an apparent curled translucent capsule remnant was seen and grasped. The whole lining of the cornea peeled off. A diffuse haze in the upper half of the cornea cleared in fifteen days, with 6/36 vision. One discussor of the paper told of accidentally irrigating the anterior chamber with 1 to 40 carbolic acid, which destroyed the endothelium

and caused a ground-glass cornea. Another used HgCl_2 , 1 to 6000, with a like result. Lawrence G. Dunlap.

Thompson, R., Gallardo, E., and Khorazo, D. **Precipitins in the ocular tissues of rabbits generally and locally immunized with crystalline egg albumin.** *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 852-858.

Whalman, H. F. **Dinitrophenol cataract.** *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 885-888.

Wright, R. E. **Incidence of cataract at certain age periods in South Indian districts.** *Brit. Jour. Ophth.*, 1936, v. 20, Sept., p. 545.

The author offers the findings of the Indian Research Fund Association for answer to the frequent query why cataract is so common in India. Of 2,000 outdoor workers 40 to 60 years old in an arid district, one in 5.1 had cataract. Of the same number of workers of the same age range in a more humid fertile district, one in 3.4 had cataract. Apparent, rather than actual, ages were given, so that the patients probably looked much older than their years.

D. F. Harbridge.

10

RETINA AND VITREOUS

Avizonis, P. **Personal experiences with treatment of retinal detachment by diathermy coagulation.** *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 366-370.

A blunt electrode is applied to numerous points over the region of the detachment, a current of 24 to 25 ma. being utilized for two or three seconds at each point. A needle electrode is finally used to perforate the sclera. The causes of detachment and the types of tear are described. Forty-nine operations were done on 33 eyes of 32 patients. Complete cure was effected in 23 cases, eight cases were partially relieved. The complications were severe iritis, and in five cases vitreous opacity.

P. J. Leinfelder.

Bailliant and Schiff-Wertheimer. Considerations on one hundred cases of detachment of the retina operated upon by diathermy coagulation. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 373-379.

All the cases were treated in the same manner—blunt electrode followed by needle perforation. The technique is well tolerated, it is simple, and observation with the ophthalmoscope is easy. The authors believe this method to be the best for obliteration of tears whether disinsertions of the ora serrata or very fine ruptures. It is not sufficient, however, in tears situated on the elevation of the detachment, in ragged folded tears, or in tears in the macular region. Of the one hundred operations cures were obtained from 56, no result in 36, some benefit in the remaining eight.

P. J. Leinfelder.

Barondes, R. de R. Glycerol trinitrate (nitroglycerine) in the treatment of hemeralopia (night-blindness). *Brit. Jour. Ophth.*, 1936, v. 20, Sept., pp. 528-531.

To the usual causes of night-blindness the author would add another—a circulatory disturbance or dysfunction causing spasticity of the retinal arteries and capillaries. Under this condition there is a deficiency of blood supply to the light-perceiving layer of the retina. The author's findings are based on five adult cases of night-blindness, experiments being carried on with various vasodilating drugs. Nitroglycerine proved the most helpful of the drugs administered, coated tablets being used to maintain the proper dosage. Its effect on the central nervous system and on the blood pressure, however, suggests care in its administration.

D. F. Harbridge.

Bietti, G. B., and Lugli, G. Researches on the behavior of the naso-retinal reflex. *Riv. Oto-Neuro-Oft.*, 1936, v. 13, Jan.-Feb., pp. 66-92.

The reflex was found in 85 percent of normal cases. With the ophthalmodynamometer the arterioretinal pressure was found increased in 34 cases and decreased in six cases. With

the endoptoscope the course of the red cells was seen to be slower than normal and their shape roundish. The reflex is between the trigeminal endonasal terminations and the sympathetic filaments reaching the retinal blood vessels. Its existence suggests the influence that stimuli from the nasal mucous membrane may have on the retinal circulation in ocular pathology. The author suggests an attempt at modifying the circulation of the retina and optic nerve by way of the nasal mucous membrane. (Bibliography.)

M. Lombardo.

Chitnis, V. K. Diathermy in treatment of detachment of retina. *Bombay. Folia Ophth. Orientalia*, 1936, v. 2, April, p. 107.

Among the 53 patients with detached retina who presented themselves for treatment 30 were operated upon according to Larsson's surface coagulation method and 50 percent of cures were obtained. The remaining cases were rejected as unsuitable for operation.

R. Grunfeld.

Coppez, Léon. Improvement in technique of pyrometric diathermy coagulation in treatment of detachment. *Bull. Soc. Franç. d'Ophth.*, 1935, v. 48, pp. 385-391.

Only by heating to 80°C. is an adequate reaction obtained. The electrode must be held in one place for thirty seconds. Temperature and not milliamperage is the guide in therapy. When needle punctures are called for a modified pyrometer serves the double purpose. Special considerations are discussed.

P. J. Leinfelder.

Espildora Luque, C. Retinal angiography in the hypertension and the retinitis of pregnancy. *Arch. de Oft. de Buenos Aires*, 1936, v. 11, May, p. 272.

Retinal angiography permits differential diagnosis between true eclampsia of pregnancy and pseudoeclampsia of renal origin. The former does not exhibit any alteration of the vessel wall but abundant retinal exudates. (6 case reports.)

M. Davidson.

Friedenwald, J. S., and Stiehler, R. D. The structure of the vitreous. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 237-265. (See *Amer. Jour. Ophth.*, 1936, v. 19, April, p. 363.)

Gallois, Jean. Notes on the medical problem of detachment of the retina. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 300-303.

It must be remembered that there are other causes of detachment of the retina besides retinal tears. The author cites detachment occurring in uveitis, renal retinitis, endocrine disturbances, modification of retinal circulation, hypothyroidism, and migraine. Careful general examination is as important in treatment as a search for tears.

P. J. Leinfelder.

Gallois, J., and Giroux, R. Retinal angiography and early diagnosis in cardiovascular pathology. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 289-293.

Enlargement of the arteries is frequently associated with arterial hypertension and has led to diagnosis of a general hypertonic state with dilatation of the aorta in four patients. Perivascular changes in young patients are indicative of spasm of the arterial system, and in two cases the authors were able to recognize an unsuspected underlying aortic lesion.

P. J. Leinfelder.

Goerlitz, Martin. Detachment of the retina and pregnancy. Further experiences with operative treatment of retinal detachment. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 22.

Goerlitz reports on his 56 further cases (87 in all); 48 operated on according to Weve's method with complete success in 26; four according to Gonin, all successful; four according to Safar and Vogt. A series of detailed clinical histories show that even extensive, apparently almost hopeless, detachments and cases complicated by severe general disease or by pregnancy can be cured by this operation. The value of Weve's operation does not exclude Gonin's ignipuncture in certain

cases with small well localized and accessible tears. Goerlitz demonstrates on a case that detachment in a very myopic eye during pregnancy without toxicosis and without related retinal changes is not an indication for interruption of pregnancy. (Illustrations.)

C. Zimmerman.

Gradle, H. S., and Meyer, S. J. The surgery of retinal detachment. *Amer. Jour. Ophth.*, 1936, v. 19, Oct., pp. 873-881.

Guillot, P. Retinal tears without detachment. *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 317-322.

In three cases of retinal tear in myopes there was no retinal detachment. This was attributed to the sealing effect of localized areas of choroiditis that surrounded the tears. The authors believe this to be a sign that the tear will not progress, but if the retina is wavy or presents a hammered appearance the prospect is that detachment will occur.

P. J. Leinfelder.

Hildesheimer, Shalom. Strip-like scleral excision and subsequent cauterization with caustic potash in retinal detachment. *Folia Ophth. Orientalia*, 1935, v. 2, Nov., p. 12.

For treatment of retinal detachment the author combined the Lindner-Guist chemical cauterization method with shortening of the coats of the eyeball. A scleral strip is excised with a loop-shaped electrical knife at the site of the hole. Having assured himself by animal experimentation of the easiness of performance and of the safety of the operation, the author treated fifteen patients by this method. Complete cure was obtained in six cases. In three cases partial detachment remained, but the process came to a standstill. Six cases remained unimproved.

R. Grunfeld.

Holloway, T. B., and Fry, W. E. Vitreous detachment, anterior dialysis, and over the optic nerve a tumor-like mass consisting of the detached retina. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 209-219.

A patient aged 22 years received a severe blow on the back of the head. Two weeks later the left eye became inflamed, and at the end of three months the vision was lost. On examination a large whitish mass was found made up of convolutions suggesting the appearance of the frontal lobe. The tension was 17 mm. Hg (Schiötz). The eye was removed. The vitreous was almost completely detached and occupied the anterior half of the vitreous cavity, and the tumor mass, which was the completely detached retina, covered the papilla and extended 8 mm. forward from it. Marked cystic degenerative changes were found in the detached retinal mass. A detailed microscopic study of all tissues of the eye is included.

C. Allen Dickey.

Igersheimer, Josef. *Peculiar relations between the brain and the eye.* *Folia Ophth. Orientalia*, 1936, v. 2, April, p. 115.

* There exist diseases of the brain documenting themselves in diffuse ganglion cell degeneration and clinically in impairment of intelligence that are accompanied by a disease of the retina, either by degeneration of the optic nerve ganglion as in Tay-Sachs disease, or by degeneration of the retinal ganglion as in the juvenile form of amaurotic family idiocy, or in the Lawrence-Biedl syndrome. Atypical cases were also observed by the author. In a child with adiposogenital dystrophy fine pigmentation along the retinal vessels was noted, an atypical retinitis pigmentosa. In another child with adiposogenital dystrophy the vision was greatly reduced and the patient complained of hemeralopia, pointing to disease of the rods and cones. The third case was one of acromegaly with chorioretinitis pigmentosa and hemeralopia, with greatly reduced vision and contracted visual fields. The fourth case was one of adiposogenital dystrophy with spiderweb pigmentation of the retina, optic nerve atrophy, and homonymous hemianopia.

R. Grunfeld.

Jeandelize, Baudot, and Gault. *Aphakia and detachment of the retina.* *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 305-316.

Nine cases of detachment of the retina following cataract extraction were observed, the interval varying from five months to 48 years. A number of the patients were myopes, and no relationship existed between the occurrence of detachment and the type of cataract extraction. The prognosis for cure is poorer in aphakic eyes. The authors were successful in one of four cases in which a tear was seen, and in two of five in which a tear could not be seen.

P. J. Leinfelder.

Kirwan, E. O'G. *The treatment of retinal detachment with an analysis of seventeen cases.* *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 187-199.

The author discusses the various operations, including those of Gonin, Guist, Larsson, Weve, and Safar. At the Eye Infirmary, Medical College, Calcutta, the Larsson method is used. Of seventeen cases reported in detail, 41 percent recovered with improved vision and 18 percent without improved vision, and 41 percent were failures.

Lawrence G. Dunlap.

Koman Nayar, K. *Von Hippel's disease.* *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 200-201.

After a four-year interval a further report is made on a case previously referred to in the Report of the Government Ophthalmic Hospital, Madras, 1928, p. 14.

Lawrence G. Dunlap.

López Enríquez, M. *Recent cytologic research on the pathologic vitreous.* *Bull. Soc. Franç. d'Opht.*, 1935, v. 48, pp. 298-299.

In pathologic conditions cells migrate to the vitreous which are not unlike the cells described by Hortega in various diseases of the brain, retina, and optic nerve. Their presence is not indicative of a specific malady.

P. J. Leinfelder.

Mawas, Jacques. **Pathologic histology of retinal detachment.** Bull. Soc. Franç. d'Ophth., 1935, v. 48, pp. 345-347.

In all cases the author finds lesions in the pigment epithelium and vascular disturbances. Most cases show exudation or hemorrhage. The vitreous does not play any primary part in causing detachment. Tears are not formed except in idiopathic detachment, and then they are the result of local retinal disease (retinomalacia polycystica). Vitreous floaters of retinal origin precede detachment, and in recent cases the subretinal fluid is entirely different from vitreous. P. J. Leinfelder.

Meyerbach, Fritz. **Retinitis pigmentosa and internal secretions.** Folia Ophth. Orientalia, 1935, v. 2, Nov., p. 59.

Encouraged by the improvement achieved with menformon, an ovarian preparation, in treatment of retinitis pigmentosa, the results of which were published in an earlier paper (see Amer. Jour. Ophth., 1934, v. 17, p. 575), the author continued to treat the same patient with increased doses of menformon. Further improvement in vision and enlarged visual fields were obtained. R. Grunfeld.

Mukerjee, S. K. **Ocular affections in diabetes.** Proc. All-India Ophth. Soc., 1935, v. 4, pp. 86-94.

After the usual discussion of ocular complications of diabetes, the author questions the statement that retinal diabetic changes are due to concomitant renal defects.

Lawrence G. Dunlap.

Noelle-Chomé-Bercious. **Detachment of the retina and postoperative hemorrhage.** Bull. Soc. Franç. d'Ophth., 1935, v. 48, pp. 323-325.

Three cases had intraocular hemorrhage following thermocauterization or diathermy puncture for detachment of the retina. The hemorrhages occurred on the third day, on the twelfth day, and in five months respectively, and the author attributes them to absorption of a blood clot formed during treat-

ment. Intervention in the region of the vortex veins, as was necessary in the author's case, may have influenced the occurrence. P. J. Leinfelder.

Pereira, R. F. **Six Safar operations for detachment of the retina.** Arch. de Oft. de Buenos Aires, 1936, v. 11, May, p. 315.

This series, in addition to that of fifteen reported previously, confirms Pereira's enthusiasm for surgical intervention. M. Davidson.

Pesme, Paul. **A pyrometric controller with variable zero for ocular diathermy.** Bull. Soc. Franç. d'Ophth., 1935, v. 48, pp. 361-365.

In the author's instrument a thermocouple incorporated with the electrode is connected with a galvanometer that is graduated in degrees. At the start of the operation the galvanometer is adjusted to read the same as the room temperature. Either a flat scleral electrode or a point for perforation may be used. P. J. Leinfelder.

Pillat, A. **Superior vitreous detachment.** Klin. M. f. Augenh., 1936, v. 97, July, p. 60.

Pillat describes and illustrates the morphologic features of superior vitreous detachment observed in a woman of 61 years, 14 and 24 days after successful intracapsular extraction of cataract in the respective eyes. Three important new types of superior vitreous detachment are discussed in detail. One, in the shape of a tent, may lead to retinal detachment. The subjective complaints of lightning flashes and seeing sparks find their explanation in those cases where circumscribed synechiae between retina and vitreous prevent total detachment of the vitreous. (Illustrations)

C. Zimmermann.

Polack, A. **Diathermy and thermopuncture in retinal detachment.** Bull. Soc. Franç. d'Ophth. 1935, v. 48, pp. 392-394.

The author concludes that Gonin's thermopuncture gives more lasting re-

sults and more firm scar tissue, and is to be preferred in all cases to which it is applicable. P. J. Leinfelder.

Prigozhina, A. L. Hereditary degeneration of the macula lutea. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 6, p. 820.

A review of the literature and brief reports of five clinical cases.

Ray K. Daily.

Sen, K. Night blindness and vitamin-A deficiency. *Proc. All-India Ophth. Soc.*, 1935, v. 4, pp. 76-81.

Sen gives a historical account of night blindness, which he considers due to disturbed regeneration of visual purple. Cases have been cured in twelve hours even with one dose of cod liver oil. Nine cases were cured in an average of one week on cod liver oil. Three cases taking an average of twelve carrots daily were cured in 20 to 25 days. Catarrhal jaundice cases were found to have night blindness, which was cured when the jaundice was cured.

Lawrence G. Dunlap.

Tristaino, L. Jensen's juxtapapillary retinochoroiditis. *Boll. d'Ocul.*, 1936, v. 15, April, pp. 431-436.

In answer to a criticism of his previous article the author states that typical Jensen's retinochoroiditis is located at the nasal side of the disc and connected with it; causing typical sector scotoma with its apex toward the blind spot. Typical Jensen's disease shows also more or less intense edema of the papilla, which demonstrates that it starts and develops from the sheaths of the optic nerve. Cases which do not reproduce the characteristic symptomatology in regard to the seat of the lesion and the number of foci are to be considered as atypical.

M. Lombardo.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Sobánski, J. Depression therapy of tabetic atrophy of the optic nerve. *Klin. M. f. Augenh.*, 1936, v. 97, July, p. 1.

Depression therapy aims to regulate the circulation of the retina and of the intraocular portion of the optic nerve by decreasing intraocular tension and increasing the general blood pressure. For depressing intraocular tension pilocarpin was used and in some cases cyclodialysis was performed. As blood-pressure tonics intravenous injections of strychnine, neurotonin, hormotone, or triplex quadrotone were given during interruption of antiluetic treatment. Of the 37 patients thus treated so far, 13 had one blind eye each. In 40 eyes of 31 cases improvement was obtained, in 11 none. Ten eyes finally showed deterioration of vision, four of them after transient improvement. The time of observation varied between twenty months and less than one year. Seven clinical histories are given in detail. (Illustrations.)

C. Zimmermann.

12

VISUAL TRACTS AND CENTERS

Farberov, B. E. Roentgenologic and ophthalmologic signs in tumors of the hypophysis. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 6, p. 846.

A detailed interpretation of roentgenograms and ophthalmoscopic findings in pituitary tumors.

Ray K. Daily.

Johnson, T. H. Homonymous hemianopia: Some practical points in its interpretation, with a report of forty-nine cases in which the lesion in the brain was verified. *Trans. Amer. Ophth. Soc.*, 1935, v. 33, pp. 90-113. (See *Amer. Jour. Ophth.* 1936, v. 19, Sept., p. 823.)

13

EYEBALL AND ORBIT

Klijkova, A. L. Mucocoele of the fronto-ethmoidal sinus. *Sovietskii Viestnik Opht.*, 1936, v. 8, pt. 6, p. 859.

A report of a case which was operated on and made a complete recovery with conservation of normal vision.

Ray K. Daily.

Puglisi-Duranti, Giovanni. Unilateral microphthalmos and ribbon opac-

ity of the cornea. *Boll. d'Ocul.*, 1936, v. 15, May, pp. 535-550.

The congenitally small right eye of a girl of eleven years was enucleated because of inflammation. The eyeball showed absence of the optic nerve, ribbon opacity of the cornea, a gliomatous mass in the vitreous, atypical incomplete coloboma of the iris up and nasally, atypical temporal coloboma of the choroid, ossification of the choroid, ossification near the ectopic lens, and partial obliteration of the angle of the anterior chamber. In view of the age of the patient, the author is of the opinion that the inflammatory symptoms were secondary to the internal condition of the eye. (Bibliography, 9 figures.)
M. Lombardo.

14

EYELIDS AND LACRIMAL APPARATUS

Hagedoorn, A. *Senile keratoma*. *Klin. M. f. Augenh.*, 1936, v. 96, June, p. 816.

A man of 56 years presented in the skin of the upper lid a flat hard movable tumor the size of a bean. It looked like a scab. Removed through an incision in the healthy parts, it was found to be free from muscles and tarsus. Histologically it was characterized by parakeratosis and hyperkeratosis, irregularity of the epithelium, pathologic cell forms, and absence of pigment. The condition occurs on the uncovered parts of the body and is related to senile verruca, which is more often found on the trunk. (Illustrations.)

C. Zimmermann.

Kattan, M. A. *El. Leishmaniasis of the eyelids and conjunctiva in Egypt*. *Bull. Ophth. Soc. Egypt*, 1935, v. 28, p. 12.

Cases of dermal leishmaniasis (oriental sore) found in a survey of the district of Hehia are reported and a description of the lesions and causative organisms is given. Diathermy coagulation is recommended as the most satisfactory form of local treatment.

Edna M. Reynolds.

Magnus, J. A. *Correction of ptosis by two strips of fascia lata*. *Brit. Jour. Ophth.*, 1936, v. 20, Aug., pp. 460-464.

Briefly reviewing the technique of Everbusch, Hess, Motais, and Derby in correction of ptosis, the author states his preference for the method of Lexer of Munich, not so well known in England. The lagophthalmos common to the better known methods is absent in the Lexer operation. The seven steps of the operation are clearly explained. Magnus also finds the Lexer method easier when the levator is not completely paralyzed. (Five figures.)

D. F. Harbridge.

Petragnani, Vittorio. *Mycotic dacryocanaliculitis*. *Boll. d'Ocul.*, 1936, v. 15, May, pp. 525-534.

A woman of 48 years had had epiphora of the right eye for a few months. A dense pus came from the lower punctum and with a probe introduced through the upper canaliculus a hard body was felt near the sac. This proved to be a round gray concretion 2 mm. in diameter. Microscopic examination shows numerous mycelial filaments, not identified. (Bibliography, one figure.)

M. Lombardo.

Tobgy, A. F. *Plastic operations for the restoration of the upper lid*. *Bull. Ophth. Soc. Egypt*, 1935, v. 28, p. 21. (See *Amer. Jour. Ophth.*, 1936, v. 19, May, p. 445.)

NEWS ITEMS

Edited by H. ROMMEL HILDRETH
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month.

Deaths

Dr. James William Leech, Providence, R.I., died October 6, 1936, aged 55 years.

Dr. George Oliver Sharrett, Cumberland, Md., died August 27, 1936, aged 49 years.

Dr. Henry Beckles Chandler, Arcadia, Calif., died October 7, 1936, aged 81 years.

Miscellaneous

The American Board of Ophthalmology will conduct an examination at Los Angeles, Saturday, January 23, 1937. All applications for this examination should be filed before December 1st, and case reports must be submitted before January 1st. For information please write at once to: Dr. John Green, Secretary, 3720 Washington Blvd., St. Louis, Mo.

The Annual Conference of the National Society for the Prevention of Blindness will be held in Columbus, Ohio, December 3, 4, and 5, 1936. Local official and unofficial agencies are actively coöperating in the arrangements for the Conference. Among the sessions that have been planned are: Eye health in relation to social work; Rehabilitation vs.

relief; Sight-saving classes in the public schools; Eye health of college students; Teacher education on eye health; Joint dinner meeting with the Columbus Medical Society; Saving eyesight in industry; The nurses' approach to eye health.

Societies

The first European Congress of Plastic Surgery was held in Brussels on October 3 and 4, 1936.

The fourth Congress of the Latin Medical Press was held in Venice September 29 to October 3, 1936, under the patronage of the Italian Ministry of National Education.

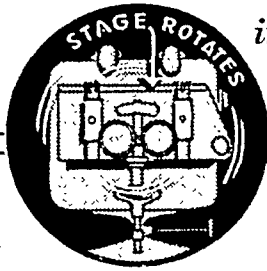
Personals

After the revolution broke out in Catalonia, Dr. Arruga and his family removed to Toulouse, France, and Dr. Barraquer to Marseille.

Dr. Derrick T. Vail has been appointed professor and head of the Department of Ophthalmology in the University of Cincinnati College of Medicine, to succeed the late Dr. Clarence King.

The Value of Rotary Excursion

by L. R. WOTTRING



inventor of the ROTOSCOPE

IN MY travels throughout the country, and in talking to the many Ophthalmologists using the Rotoscope, I hear this comment:—

“One feature I like about your instrument is *rotary excursion**—my patients seem to respond more quickly with this type of training.”

And, these Ophthalmologists are right—*rotary excursion* is essential for complete Orthoptic Training. *Rotary excursion* of the stage brings about perfect group action of the muscles of each eye, thus permitting perfect co-ordination of the two eyes.

Further value of Rotoscope *rotary excursion* is the fact that it is dynamic rather than static—stimulations are not of a fixed

type, which tends to bring about more rapid progress of the case, with more permanent results. Circulation in the ocular orbit is stimulated, with improved elimination of fatigue products.

Rotary excursion is only one of the features which have made the Rotoscope the most universally used instrument in the Ophthalmological field. In subsequent messages I will discuss the various essentials of diagnosis as applied to Orthoptic cases with the Rotoscope.

L. R. Wottring



Before you invest in an Orthoptic instrument, investigate the Wottring Rotoscope, now being used by leading Ophthalmologists, hospitals and Clinics. Any distributor listed below will gladly demonstrate the Rotoscope, or send you literature on request.

* Exclusive with the Rotoscope

ROTOSCOPE DISTRIBUTORS

- | | | |
|---|---|---|
| • Colonial Optical Co.
62 West 47th Street, New York | • Riggs Optical Co.
Flood Bldg., San Francisco, Calif. | • Imperial Optical Co.
Toronto, Canada |
| • McIntire, Magee & Brown Co.
9th & Sansom Streets, Philadelphia | • Southeastern Optical Co., Inc.
Richmond, Va. | • National Optical Co., Ltd.
Montreal, Canada |
| • Riggs Optical Company
1449 Merchandise Mart, Chicago | • The White-Haines Optical Co.,
Columbus, Ohio | • McLeod Optical Co., Inc.
357 Westminster St., Providence, R.I. |

THE SIGHT-SAVING REVIEW

LEWIS H. CARRIS, *Editor*

ISOBEL JANOWICH, *Managing Editor*

Board of Editors

Mary Beard, R.N.

Edward Jackson, M.D.

E. V. L. Brown, M.D.

A. B. Meredith

A. J. Chesley, M.D.

A. L. Powell

Percy W. Cobb, M.D.

C. O. Sappington, M.D.

Gladys Dunlop Matlock

William F. Snow, M.D.

Mary V. Hun

Mark J. Schoenberg, M.D.

Thomas D. Wood, M.D.

September Table of Contents

Cosmetics Detrimental to Vision, Walter I. Lillie, M.D.

Sight Conservation As An Educational Problem, Richard S. French, Ph.D.

Eye Conditions Prevalent in Early Adult Life, Wm. F. C. Steinbugler, M.D.

Occupational Adjustment of the Visually Handicapped, Eleanor Brown Merrill

The Cross-Eyed Child, Brittain F. Payne, M.D.

Conserving the Vision of Deaf and Hard-of-Hearing Children, Mary May Wyman

Education for the Visually Handicapped, Christine P. Ingram

Pictorial Review:

Safeguarding the Eyes of Children

Note and Comment; Current Articles of Interest; Book Reviews

THE SIGHT-SAVING REVIEW

Subscription \$2 a year; sample copy free

Published by the

National Society for the Prevention of Blindness, Inc.

50 West 50th Street, New York, N.Y.

AMERICAN JOURNAL OF OPHTHALMOLOGY
PRESCRIPTION OPTICIANS

IX

BOSTON, MASS.

Bartlett & Son Company
346 Boylston Street
Specialists in the making of Eyeglasses
and Spectacles from Oculists' prescriptions.

Boston, Mass.

Pinkham & Smith Company
292 Boylston Street
15 Bromfield Street
Established 1896
Member Guild of Prescription
Opticians of America

BROOKLYN, N.Y.

J. H. Penny, Inc.
144 Joralemon St.
Medical Arts Building

BUFFALO, N.Y.

Buffalo Optical Company
559 Main Street
Peter Meyer, Oscar Cleal, Herbert Derrick
—Established 35 Years—
Member Guild of Prescription Opticians of
America

CHICAGO, ILL.

Almer Coe & Company, Opticians
105 N. Wabash Ave. (Three other Stores)
Bausch & Lomb Ophth. Instruments
Carl Zeiss (Jena) Microscopes
Carl Zeiss Telescopic Spectacles for
Diagnosis and Surgery
Carl Zeiss Spectacle Magnifiers

DENVER, COLO.

Symonds-Atkinson Optical Company
424 Sixteenth Street
Denver's only strictly dispensing opticians

DENVER, COLO.

Paul Weiss, 1620 Arapahoe Street
Prescription Optician
FUSION TUBES
OPTICAL DEMONSTRATION SETS
Optical Specialties made to order.

EAST ORANGE, N.J.

H. C. Deuchler
Guildcraft Optician
541 Main Street
Eye Physicians prescriptions exclusively
Member Guild of Prescription Opticians
of America

PORTLAND, ORE.

Hal H. Moor, 315 Mayer Bldg.
Dispensing Optician
Oculists' prescriptions exclusively

PASADENA, CALIF.

Arthur Heimann
Guild Optician
36 N. Madison Ave.

NEWARK, N.J.

J. C. Reiss, Optician
Dispensing Exclusively
10 HILL STREET
Oldest Optical House in New Jersey
Established 1892
Member Guild of Prescription Opticians
America

New York City

E. B. Meyrowitz
INCORPORATED

Optician Established 1875
520 Fifth Ave., New York
255 Livingston St., Brooklyn
Member Guild of Prescription Opticians of
America

PHILADELPHIA, PA.



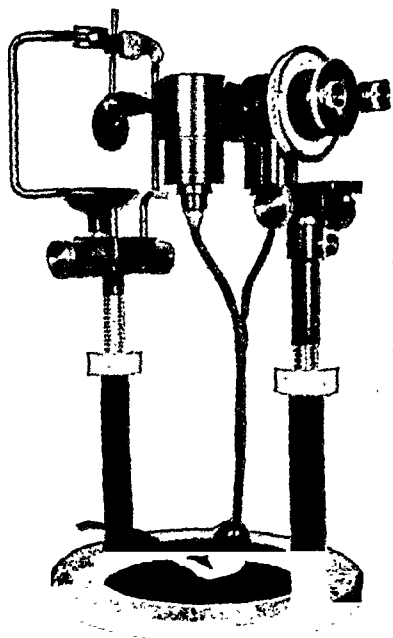
Prescription Opticians—since 1890

SAN FRANCISCO, CALIF.

John F. Wooster Company
234 Stockton St.
Prescription Opticians

ST. LOUIS, MO.

Erker Bros. Optical Co.
610 Olive Street
518 N. Grand Boulevard
Established 1879
Member Guild of Prescription Opticians of
America



ZEISS

OPHTHALMOMETER

An instrument of entirely new construction which serves to measure

The radius of curvature of the anterior surface of the cornea from 5 to 12 mm. with an accuracy of 1/100 mm. The refractive power of the cornea from 28 to 66 D with an accuracy of 1/8 D.

The direction of the 2 principal meridians with an accuracy of 0.5 degree.

The power of the cornea in each of the 2 principal meridians and the corneal astigmatism.

Price on application

485 Fifth Avenue
NEW YORK

CARL ZEISS, INC.

728 S. Hill Street
LOS ANGELES

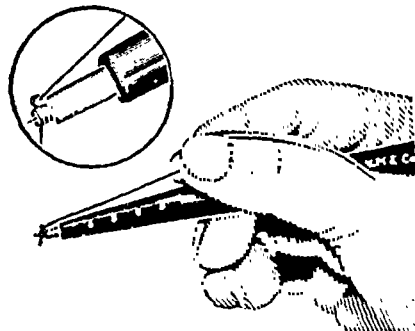


OPHTHALMIC HIGH FREQUENCY UNIT

For the treatment of Retinal Detachment

By CLIFFORD B. WALKER, M.D.

A distinguishing feature of the Walker Unit is its ability to produce an unprecedented minimum current volume with a wide enough latitude of control to assure accuracy of dosage. Entire control of current intensity is by one dial—by advancing or retarding this dial greater or lesser amounts of current are immediately available. Small, compact, portable, absolutely safe, and



easy to operate. The illustration on the top right shows the position of the bakelite handle in the hand with thread attached to the micro-pin and held between the thumb and index finger. Inset is an enlargement of the coil-like iridium platinum micro-pin with thread attached. Complete information sent on request.



V. MUELLER & CO.

SURGEONS' INSTRUMENTS SINCE 1895 HOSPITAL SUPPLIES & EQUIPMENT

OGDEN AVE. - VAN BUREN and HONORE STREETS
CHICAGO, ILL.

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3 VOLUME 19

1936

EDITORIAL STAFF

LAWRENCE T. POST, Editor

WILLIAM H. CRISP, Consulting Editor

EDWARD JACKSON, Consulting Editor

HANS BARKAN

HARRY S. GRADLE

H. ROMMEL HILDRETH

PARK LEWIS

M. URIBE TRONCOSO

C. S. O'BRIEN

JOHN M. WHEELER

EMMA S. BUSS, Manuscript Editor

COLLABORATORS

EUGENE BLAKE, *New Haven, Connecticut*; RAMON CASTROVIEJO, *New York*; F. M. CRAGE, *Chicago*; BEULAH CUSHMAN, *Chicago*; RAY K. DAILY, *Houston, Texas*; M. DAVIDSON, *New York*; C. ALLEN DICKEY, *San Francisco*; LAWRENCE G. DUNLAP, *Anaconda, Montana*; R. GRUNFELD, *Rockville Centre, Long Island*; F. H. HAESSLER, *Milwaukee*; D. F. HARBRIDGE, *Phoenix*; DAVID O. HARRINGTON, *San Francisco*; GEORGE N. HOSFORD, *San Francisco*; J. HEWITT JUDD, *Omaha*; BERTHA KLIEN, *Chicago*; HARVEY D. LAMB, *Saint Louis*; P. J. LEINFELDER, *Iowa City*; PARK LEWIS, *Buffalo*; M. LOMBARDO, *Brooklyn*; JOHN C. LONG, *Denver*; MAURICE MARCOVE, *Denver*; EDNA M. REYNOLDS, *Denver*; H. D. SCARNEY, *Detroit*; T. M. SHAPIRA, *Chicago*; GEORGE H. STINE, *Colorado Springs, Colorado*; GEORGIANA D. THEOBALD, *Oak Park, Illinois*; J. B. THOMAS, *Palo Alto, California*; D. L. TILDERQUIST, *Duluth, Minnesota*; DERRICK VAIL, *Cincinnati*; CHARLES ZIMMERMANN, *Milwaukee*.

PUBLISHED BY THE OPHTHALMIC PUBLISHING COMPANY

640 South Kingshighway, Saint Louis, Missouri

PLATES IN VOLUME 19, 1936

	Page
Plate 1 (color)—Lipemia retinalis, James H. Allen and William A. Howardfacing	645
Fig. 1. Fundus O.S.—72 hours after admission.	
Fig. 2. Frozen section of skin (xanthoma diabeticorum).	
Fig. 3. Frozen section of deltoid muscle showing fat in the lumen of an arteriole, in cells of the vessel wall, and in mononuclear cells in the perivascular tissue.	
Plate 2 (color)—Roentgen-ray cataract, P. J. Leinfelder and H. D. Kerrfacing	739
Fig. 1. Ophthalmoscopic appearance of stationary posterior polar cataract in a rabbit.	
Fig. 2. Late appearance of the lens, Rabbit I-2.	
Fig. 3. Ophthalmoscopic appearance of stationary posterior polar opacities, Rabbit II-1.	
Fig. 4. Ophthalmoscopic appearance of posterior polar opacities, Case 2.	
Plate 3. Aneurysm of the internal carotid artery with atrophy and com- pression of the optic nerve, John O. Wetzel.....facing	1053

NAME INDEX

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Abdulaev, G. G. (1910), (1040), (1040), (1045).
 Abeloos. (1048).
 Abraham, S. V. 139, 1094.
 Abramowicz, I. (359), (631).
 Adamantiadis, B. (76).
 Adams, P. H., see Greeves, R. H.
 Adler, F. H. 804.
 and Berner, G. E., and Meyer, G. P. 49.
 and Meyer, G. P. (1125).
 Adrogué, E., and Malbran, J. (272), (733), (813).
 and see Puiggari, M. I.
 Agatston, S. A., see Smoleroff, J. W.
 Agnello, F. (87), (272), (1042), (1127).
 Alabaster, E. B. (1127).
 Alaerts. (350).
 Alajmo, B. (1031).
 and Rubino, A. (270).
 Albers, E. C., and Sheard, C. 407, 460.
 Albrich, K. (445).
 Alcalá Lopez, A. (439).
 Alexander, C. S. (629).
 Alexandrovich, E. V. (535).
 Alexseeva, V. I. (447).
 Ali ibn Isa. 618.
 Aliquo-Mazzei, A. (1028).
 Alkio, V. V. (629).
 Allen, H. E. 423.
 Allen, J. H., and Howard, W. A. 645.
 Allen, T. D. 613, 613, 1000.
 Almeida, A. de. (84), (629).
 Alpers, B., and Yaskin, J. (1037).
 Alvarez Castela, M., see Castela, M. A.
 Alvarez, C., see Weskamp, C.
 Alvaro, M. E. (282), (535).
 Alvis, B. Y. 429.
 Ammann, E. (264), (436).
 Amsler, M. (733).
 Anargyros, El. (538).
 Anastasi, G. (630), (1128).
 Anastasi, L. (171), (349).
 Anderson, A. L. 675.
 Andrade, A. L. de. (278).
 Andrew, J. H. (932).
 Anelli, D. (60), (62), (78), (175), (189), (284), (630), (632).
 Ankell, G. (1031).
 Anthonisen, H. (829).
 Anthony, M. (181).
 Antushevich, E. K., see Fradkin, M. I.
 Apetz, W. (1129).
 Appelbaum, A. (933).
 Appelmans. (359).
 and see Van der Straeten.
 Apple, Carl. 612, 1015.
 Appleman, L. F. (66), 154.
 Archangelskii, P. F. (730).
 Archangelskii, V. H. (538), (730), (833), (933).
 Arendt, J., see Decker, J. F. de.
 Arjona, J. (439).
 Arkin, W. (626).
 and Essigman, N. (945).
 Arnold, C. H., see Yudkin, A. M.
 Arruga, H. (277), (440), (732), (826), (1028), (1031).
 Artemiev, N. I. (723).
 Ascher, K. W. (939), (1129).
 Ask, O. (369).
 Aubineau, E. (822).
 Auchincloss, S. S., Jr., see Paton, R. T.
 Averbach, M., see Awerbach, M. I.
 Avgushevich, P. L. (185), (281).
 Avizonis, P. (813), (1045), (1139).
 Awerbach, M. I. (947).
 and Ivanova. (277).
 Azcvedo, Amir. (280).
 Badeaux, F. (933).
 Badot, J. (360).
 Bagchi, S. K. (1136).
 Bahn, C. A. (1048).
 Bailliart, P. (88), (1039).
 and Schiff-Wertheimer. (1140).
 Bajenova, M. (933).
 Bakker, C. (66).
 Bakly, M. A. El. (1040).
 Balada, M., see Balado, M.
 Balado, M. (939).
 and Malbran, J. (442).
 and see Urrets Zavalía, A.
 Balcet, C. (165).
 Baldino, S. (270).
 Balduzzi, O. (1127).
 Ballantyne, A. J. (1137).
 Baltin, M. M. (824), (914).
 Balza, J. F., and Yalour, R. R. (60).
 Bane, W. C. 241.
 and Shankel, H. W. 900.
 and see Walker, C. E., Jr.
 Banerji, N. C. (1129).
 Barkan, Hans. 129, (640).
 and Borley, W. E. 307.
 and Borley, W. E., and Fine, M., and Bettman, J. (1137).
 Barkan, Otto. (540), 951.
 and Boyle, S. F. (366).
 and Boyle, S. F., and Maisler, S. 21, 209, (359), (438).
 Baratta, O. (730), (826), (1043), (1045).
 Barbel, I. E. (919).
 Barman, K. P. (1131).
 Barondes, R. de R. (1140).
 Barrat, see Yver.
 Bartels, M. (440).
 Bartley, S. H., see Fry, G. A.
 Baschenov. (171), (531).
 Basile, G. (69), (731).
 Basilevskaja, L. C., see Kisin, P. E.
 Basterra, J. (827).
 Batson, O. V. 901.
 Baudot, see Jeandelize.
 Baurmann, M. (69).
 Bazshenova, M. A., see Baschenov.
 Beach, S. J., and McAdams, W. R. (542), (947).
 Beaumel. (933).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Bedell, A. J. (347), (833), (910).
 Bednarski, A. (282).
 Beer, L. (167).
 Beetham, W. P. (933), 1112.
 Bégué, see Bichelonne.
 Behr, C. (90).
 Belgeri, F., and Dusseldorp, M. (271), (734).
 Bell, E. T., see Hanson, W. A.
 Bellavia, A. (278).
 and Mirto, F. (181).
 Bellina, G., see Mamola, P.
 Bellows, J. (542).
 Belskii, A. A., see Belsky, A.
 Belsky, A. (451).
 Bencatarangam Nayudu, T. (1137).
 Bencini, A. (272).
 Bender, A. (84).
 Bender, M. B. (630).
 Benetato, G., see Michail, D.
 Bengtson, I. A., and Rolufs, L. S. 229.
 Benham, G. H., see Duke-Elder, S. W.
 Benoit, (447), (447).
 Benstein, I. I. (437).
 Berens, C. 152, 331, (353), (353), (359), 470, (533), (718), (836), (926), (926).
 and Kerby, E. C., and McKay, E. C. (283), (836).
 and Nilson, E. L., and Chapman, G. H. 1060.
 Beresinskaja, D. I. (831), (836).
 and Plastinin, H. (527).
 and Wolfson, and Gornetz, and Itzikson, and Epstein. (831).
 Bergmeister, R. (934).
 Berman, A. H., see Kazas, I. I.
 Berner, G. E., see Adler, F. H.
 Bertotto, E. (171).
 Bertosch, M. (87).
 Bettman, J., see Barkan, H.
 and see Horner, W. D.
 Bhaduri, B. N. (1137).
 Bichelonne, Favory, and Bégué. (1122).
 Bickerton, R. E. (189).
 Bielschowsky, A. (910).
 Bienstock, F. (637).
 Biernacka-Biesiekiarska, J. (451).
 and Wieczorek, A. (547).
 Bietti, G. (66), (270), (626), (1040).
 and Lugli, G. (1140).
 Biffis, A. (171).
 and Mayer, A. (350).
 Biontovskaia, E. G. (182).
 Biozzi, G. (730), (833), (1135).
 and Lugli, L. (63).
 Birch-Hirschfeld. (824).
 Birich, T. V., and Shapiro, P. H. (836).
 Biró, E. (540), (915).
 Biro, I. (640).
 Bishop, G. H. (350).
 Bistis, J. (354).
 Biswas, P. K. (1131).
 Black, G. W. (946).
 Blaess, M. J., see Bothman, L.
 and see Wolfe, O.
 Blake, E. M., see Gesell, A.
 Blaskovics, L. (635).
 Blegvad, O. (929).
 and Möller, H. U. (354).
 and see Möller, H. U.
 Blobner, F. (267).
 Boardman, W. W. (542).
 Böck, J. (268).
 Boeckmann, E. 513.
 Bogoslovskii, A. I. (1125).
 Bokstein, F. S. (827).
 Bologova, T. A. (929).
 Bonnet, P. (63).
 Borley, W. E., see Barkan, H.
 Borochoovich, S. I. (182).
 Borsellino, G. (80), (85), (280), (527).
 and see Sala, G.
 Borsotti, I. (347), (1131).
 Boshes, B., and Mayer, L. L. 338.
 Bossalino, G. (60), (734).
 Boström, C. G. 434.
 Bothman, L., and Rolf, D. E. 26.
 and Blaess, M. J. 1072.
 Boyce, W. A. 703.
 Boyle, S. F., see Barkan, O.
 Bradish, R. F. 423.
 Brandenburg, K. C. (1125).
 Brandes, F. (451).
 Braun, R. (1039).
 Brav, A. (356), 894.
 Bray, E. R. 422.
 Brecher, L. (61), (534), (731), (910).
 Brenta, J. (451), (1031).
 Bressler, J. L. (926), 989, 1014, 1015.
 Briggs, A. H. (444).
 Brinck, G. (926).
 Brobeck, V. H. 798.
 Brodski, B. S. (940).
 Brons, C. (624), (1135).
 Brown, A. L. (1136).
 Brown, E. V. L. 518, 668, 1106.
 and Evans, E. I. (1029).
 Brunton, C. E. (186).
 Bryngelson, B., see Fink, W. H.
 Bucalossi, A. (188), (627).
 Bücklers, M. (165), (1136).
 Bulach, X. O. (450).
 Bunge, E. (69), (947).
 Burch, F. E. 705, (947).
 Burchell, E. B., see Cregor, J. S.
 Burke, J. W. (717).
 Burky, E. L. 841.
 and Henton, H. C. 782.
 Burnier, P. (88), (734).
 and Sales, M. (723), (734).
 Bursuk, G. G. (190), (929).
 Busacca, Annibale. (278), (1031).
 Busacca, Archimede. (61), (354), (630).
 and Maia, J. (79).
 Buschke, W. (833), (910), (940).
 and see Goldmann, H.
 Buscmich, D. G. (447).
 Bushmitsch, D. G., see Buscmich, D. G.
 Butler, T. H., see Greeves, R. A.
 Byers, W. G. M., and MacMillan, J. A. (269), (829).
 Caevich, E. P. (176).
 Callender, G. R., and Wilder, H. C. (632).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Callewaert, H., see Hambresin, L.
 Campbell, D. A. (360).
 Campbell, E. H. 901.
 Campos, P. A. (283).
 Campos, R. (182).
 Canneyt, see Van Duyse.
 Cantonnet and Filliozat. 524.
 Caocci, G. (181), (182).
 Cardell, J. D. M. (717).
 Caramazza, F. (1122).
 Carey, H. U., and Hunt, H. M. (732).
 Carlin, C. (88).
 Carrillo, R., see Malbran, J.
 Carris, L. H. (640).
 Carroll, F. D. (185).
 and Franklin, C. R. 1070.
 Casanovas, J. (632), (813).
 Casini, F. (440).
 Cassiau, P., see Renard, G.
 Castela, M. A., and Rivas, J. de la T. (718).
 and Garcia Miranda, A. (919).
 Castelli, A. (165).
 Castresana, A. (727).
 Castrignani, G. (350).
 and see Possenti, G.
 Castroviejo, R., Jr. (63), (544), 705, 786, (910).
 and see Troncoso, M. U.
 Castroviejo, R., Sr. (723).
 Cattaneo, D. (368).
 Cavallacci, G. (85).
 Cavaniglia, A. (179).
 Cavara, V. (272).
 Cepero, G., and Comas, C. (167).
 Cerebranni, Z. M., see Maniukova, H. K.
 Chajutin, S. M. (85), (732).
 Chaldejcev, S. I. (1039).
 Chance, B. (88), 1110.
 Chapman, G. H., see Berens, C.
 Charamis, I. (354), (724).
 Charles, J. W., and Post, M. H. 126, (450).
 Charlin, C. C. (175), (355), (638), (814), (820).
 Chatterjee, N. (1138).
 Chautin, S. M. (1915).
 Chavasse, B. (926).
 Chechik-Kunina, E. A., see Chechik-Kynina, E. A.
 Chechik-Kynina, E. A. (814).
 and Levkoeva, E. F. (81).
 Chemoloso, A. (934).
 Chepurin, H. C. (450).
 Cherni, L. I., see Kaganova, O. A.
 Chernobilskaia, P. I., see Cholina, A. A.
 Chiniara, J., see Frogé, P.
 Chirkovskii, V. U., and Dimshitz, L. A. (810).
 Chistiakov, P. I. (940).
 Chitnis, V. K. (1140).
 Chojnacki, P. (279).
 Cholina, A. A., and Chernobilskaia, P. I. (531).
 and Makulskii. (531).
 Chou, C. H., see Tang, F. F.
 Choun, C. K. (279).
 Chronis, P. (281).
 Churgina, E., and Nikolajeva, M. C. (438).
 Chvorov, V. V., see Spector, S. A.
 Ciotola, G. (265).
 Claes, E. M.-J. (1042).
 Clapp, C. A. 608.
 Clark, Brant. 503.
 Clark, C. P. (547), 789, 881.
 Clark, J. H. (1029).
 Clegg, J. G. (911).
 Clerici, A. (445).
 Cobb, P. W., see Fry, G. A.
 Cockayne, E. A., and Krestin, D., and Sorsby, A. (544).
 Cogan, D. G., and Cogan, F. C. (542).
 Cogan, F. C., see Cogan, D. G.
 Cohen, M. (824).
 Colenbrander, M. C. (919), (926).
 Colledge, L., see James, R. R.
 Collenza, D. (1042).
 Collin, L. (542).
 Colomba, N. (73), (727).
 Colombo, G. (188).
 Comas, C., see Cepero, G.
 Comberg, W. (357).
 Connole, J. V. (1043).
 Contino, A. (836).
 Contino, F. (450).
 Cooke, C. T. (814).
 Cooperman, H. O. 52.
 Coppez, H. (437).
 and Stroobant, C. (940).
 Coppez, J. H. (929).
 Coppez, L. (362), (734), (1140).
 Cori, R. de', see De'Cori, R.
 Correa Meyer, J. (717).
 Cosgrove, K. W., see Vinsonhaler, F.
 Costenbader, F. D. 802, 803.
 Coston, T. O. (829).
 Courtney, R. H. 1114.
 and see Hill, E.
 Cowan, A. 287, 512, (527), 1005.
 Cowan, T. W., see Pinkerton, F. J.
 Cox, R. A. (926).
 Cozza, F. (632).
 Cragg, F. M., see Shapira, T. M.
 Creed, R. S. (920).
 Cregor, J. S., and Burchell, E. B. (281).
 Crisp, W. H. 50, 54, '93, 159, 254, 340, 430, 520, 616, 710, 805, 904, 1019, 1116.
 Cruise, Sir Richard. 519.
 Csapody, I. (77), (350).
 Cuénod, A., and Nataf, R. (61), (263), (929), (930), (930).
 Cuervo, L. V., see Ramirez Corria, C. M.
 Culler, A. M., and Simpson, W. M. (915).
 Currie, J. G. D., and Lloyd, J. P. F. (630).
 Cushman, B. (81), (640).
 Dahl, E. O. 422.
 Dallos, J. (920).
 Dalsgaard-Nielsen, E. (362), (833).
 Damel, C. S. (347), (814), (814), (911).
 and Rechniewski, C. (263).
 Daminskii, D. C. (167).
 Daniel, R. K. (810).
 Danielson, R. W. 50, 51, 426, 897, 897.
 and Walker, C. E., Jr. 603.
 Danis, M. (1032).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Danzig, H. M. (531).
 Dart, R. O. 424, 1113.
 Davidson, H. P. (190).
 Davidson, M. 757, 896.
 Davies, W. S. (65).
 Davis, L. L. 1017.
 Davson, H., see Duke-Elder, W. S.
 Dean, F. W. (927).
 Decker, J. F. de., and Arendt, J. (349).
 De'Cori, R. (81), (171), (277), (349), (350), (452).
 Deggeler, Z. B. (77).
 Dehogues, J. L. (279).
 DeJean, Ch. (362), (529), (632).
 Dekking, H. M. (527).
 Delanoë, E. (534).
 Del Barrio, A. (65).
 DeLong, P. 48.
 and Klauder, J. W. 802, 802.
 Denig, R. (721), (810).
 Denti, A. V. (1037).
 De Petri, M. (1132).
 Der Brucke, M. G. (643).
 Derer, J., and Friedman, I. (81).
 Dering, S. A. (727).
 Derkač, V. (444), (724), (727).
 Desai, H. M. (1129).
 De Sanctis, E. (927).
 de Schweinitz, G. E., see Schweinitz, G. E. de.
 Desvignes, P. (440).
 Deutschmann, R. (70).
 Diacono, E., see Viallefont, H.
 Diaz-Caneja, E. (89).
 Diaz-Dominguez, D. (815).
 Diban, P. A. (915).
 Dickey, C. A. 660, (1041).
 Di Fede, N. (66).
 Dimitrieva, V. S. (915).
 Dimmissianos, B. (355).
 Dimshitz, L. (810).
 and see Chirkovskii, V. U.
 Dintenfass, H. (734).
 Disler, H. H., and Grinko, E. P., and Shadskaja, O. (167).
 Djacos, G. (1043).
 Dobson, M. 346.
 Dodge, W. M., Jr. (361), (368).
 Doggart, J. H. 425, 610.
 Dollfus, M.-A., see Terrien, F.
 and see Veil, P.
 D'Ombraïn, A. W. (361).
 Donovan, J. A. (85).
 Doodinov, O. (721).
 Doods, E. C. (545).
 D'Oswaldo, E. (273).
 Dowling, H. (1126).
 Dozorova, H. S. (542).
 Dubois-Poulson. (1045).
 and see Magitot, A.
 Duc, C. (357).
 Dudinov, O., see Doodinov, O.
 Duggan, J. N. (527).
 and Nanavati, B. P. (934).
 Duke-Elder, Sir W. S., and Robertson, E. B., and Davson, H. (735).
 and Davson, H., and Benham, G. H. (1137).
 Dulewiczowa, M. (349).
 Dunphy, E. B. (638).
 Duraiswami, T. S. (1129).
 Durando, F. (621).
 Dusseldorp, M., see Belgeri, F.
 and see Hernandez, I. M.
 and see Lijo Pavia, J.
 Dutt, S. C. (1137).
 Dvorjetz, M. A. (186).
 Earnest, E. E. 606.
 Eber, C. 903, (920).
 Edgerton, A. E. 463.
 Edmund, C. (355).
 Edwards, E. V. 895.
 Ehlers, H. (362), (448).
 Ellett, E. C. 335, 335, (811).
 Elliot, R. H. (540).
 Emerson, L. 419.
 Emilianov, P. A., and Maslennikova, H. T. (930).
 Endelman, L. (362).
 Engel, J., see Friedman, M.
 Enriquez, L. (911).
 Epstein, see Beresinskaja, D. I.
 Erlanger, G. (915).
 Esmenard, J., see Joyeux, C.
 Espildora Luque, C. (832), (940), (1140).
 Essen-Möller, L. (724).
 Esser, A. M. (451), (451), (640).
 Essigman, N., see Arkin, W.
 Esteban, M. (63), (811).
 Euler, H., and Malmberg, M. (67).
 Evans, E. I., see Brown, E. V. L.
 Evans, J. P., see Penfield, W.
 Evans, W. H. (941).
 Eydelnanth, J. S. (1048).
 Eymers, J. G., see Fischer, F. P.
 Falcao, T. (349).
 Fanchamps, J., see Joiris, N. P.
 and see Weekers, L.
 Farberov, B. (822), (832), (911), (1144).
 Farhat, R. (452).
 Farina, F. (267).
 Favory, see Bichelonne.
 Fazakas, A. (542), (630).
 Fazio, F. (275).
 Feigenbaum, A. (1132).
 Feilchenfeld, W. (640).
 Feldman, A. I., and Wolfson, S. L. (824).
 Feldman, J. B. 510, 513, (911), (911).
 Feldman, P. B. (436).
 Fernandez Balbuena, F. (81).
 Ferree, C. E., and Rand, G. 238, (920), (920).
 Fewell, A. G., and Fry, W. D. 48, (82).
 and see Jeffers, W. A.
 and see Schweinitz, G. E. de.
 Filatov, V. P. (728), (916), (1132).
 and Schmoulian, L. P. (728).
 Filippi-Gabardi, E. (188), (445), (624).
 Filliozat, see Cantonnet.
 Fincham, E. F. (719).
 Findlay, E. K. 157.

Explanation: Numbers in heavy type refer to original articles, parenthetical numbers to abstracts

- Fine, A. (533).
 Fine, M. see Barkan, H.
 Fink, W. H., and Bryngelson, B. (353).
 Fiore, T. (85), (167), (731), (1124), (1132).
 Fischer, Franz. (621).
 Fischer, F. P. (73), (265), (361).
 and Jongbloed, J. (351).
 and Vermeulen, D., and Eymers, J. G. (448).
 Fischer, P. F., see Van Heuven, J. A.
 Fisher, E. M. (174).
 Fisher, W. A. 337, 517.
 Flaum, G., see Ralli, E. P.
 Fledelius, M. (353), (732), (927).
 Fleischer, B. (528).
 Focosi, M. (82), (176), (275), (275), (351).
 and Orzalesi, F. (638).
 and see Giannoni, A.
 Folger, H. P. (941).
 Folk, M. L. 612.
 Fontana, G. (280), (916).
 Foster, J. (717), 1010.
 Fowler, L. H., see Hanson, W. A.
 Fradkin, M. I., and Rossel, S. I., and Antushevich, E. K. (824).
 and Slavin, L. D. (638).
 and see Muselevich, A. L.
 and see Pletneva, H. A.
 Fralick, F. B., and Peet, M. M. (815), (1032).
 Franceschetti, A. (1041).
 and Kiewe, P. (1132).
 and Roulet, E. (1032).
 François, J. (355), (363), (363), (367), (930), (941), (948).
 Frank, T. J. F. (450).
 Franklin, C. R., see Carroll, F. D.
 Fridenberg, P. (452).
 Friede, R. (63), (934), (1132).
 Friedenwald, J. S. (533), 609, (927).
 and Pierce, H. F. (178).
 and Stiehler, R. D. (363), (1141).
 Friedgood, H. B. 1112.
 Friedman, I., see Derer, J.
 Friedman, M., and Engel, J. (829).
 Friedman, S. I. (719), (811).
 Friedmann, G., see Lo Cascio, G.
 Fritz, A. (363), (363), (1032), (1033), (1033).
 Frogé, P., and Chiniara, J. (1129).
 and Poursines, Y. (1129).
 Frost, A. D. (820).
 Fry, G. A. 135, (920).
 and Bartley, S. H. (717).
 and Cobb, P. W. (920).
 Fry, W. E. 153, (165).
 and see Fewell, A. G.
 and see Holloway, T. B.
 and see Jeffers, W. A.
 Fuchs, A. (351), (448).
 Gala, A. (89), (167), (168).
 and Mělka, J. (948).
 Galeazzi, C. (64).
 Galewska, S., and Litauer, R. (827).
 Gallardo, E., see Thompson, R.
 Gallino, J. A. (538).
 Gallois, J. (1141).
 and Giroux, R. (1141).
 Gamble, R. 337.
 Garcia Miranda, A. (60).
 and see Alvarez Castelao, M.
 Gardilčić, A. (930).
 Gasser, O. (454).
 Gasteiger, H. (820).
 Gastew, A. A., and Mankovetzki, S. I., and Vosnesenskaja, A. L. (538).
 Gatewood, W., and Settel, N. (1039).
 Gault, see Jeandelize.
 Gekker, P. I. (190).
 Gellhorn, E. (1126).
 and Spiesman, I. (533).
 Georgariou, P. M. (721).
 Germer, O. I., and Kulicva, M. X. (168).
 Gernet, R. (278).
 Gerschuni, G., see Volochov, A.
 Gertz, H. (347).
 Gesell, A., and Blake, E. M. (815).
 Ghio, A., see Marchesani, E.
 Giannantoni, C. (732).
 Giannoni, A., and Focosi, M. (735).
 Gifford, S. R. 57, (171).
 and Lazar, N. K. (61), (1130).
 and see Takats, G. de.
 Gilbert, W. (452), (1046).
 Gillies, H. D. (916).
 Gimenez Canovas. (529).
 Gimenez Ruiz, R. (77), (85).
 Ginandes. (281).
 Giri, D. V. (916).
 Giroux, R., see Gallois, J.
 Givner, I. E., see Troncoso, M. U.
 Globus, J. H., and Silverstone, S. M. (186).
 Goebel, O. (351).
 Goerlitz, M. (1141).
 Goldenberg, M. 338.
 Goldfeder, A. E. (176).
 Goldmann, H., and Buschke, W. (67), (941).
 Goodman, E. L. 803, (927).
 Gordon, A. (624).
 Gordon, B. L. (452), (921).
 Gornetz, see Beresinskaja, D. I.
 Goulden, C. (927).
 Govaerts, P. (1033).
 Gradle, H. S. 37, (359), 714, 1010.
 and Meyer, S. J. 873.
 and see Lenzen, A. F.
 Graham, C. H., and Hartline, H. K. (921).
 Grancini, L. E. (176).
 Grandi, G. (273), (351).
 Granit, R. (1033).
 Grandström, K. O. (359).
 Grazianskaia, L. H., and Rosanova, E. P. (921).
 Greeff, R. (452), (640), (837).
 Green, J. 16, (356).
 Greene, M. L. 1106.
 Greenfield, J. G., see Shapland, C. D.
 Greenwood, A., and Grossman, H. P. (811).
 Greeves, R. A., Marshall, J. C., Adams, P. H., Butler, T. H., and others. (1034).
 Gresser, E. B., see Ralli, E. P.
 Griffith, J. O., see Jeffers, W. A.
 Grimm, R. (353).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts.

- Grinko, E. P., see Disler, H. H.
 Groenouw. (921), (1027).
 Groff, R. A. (624).
 Grolman, G. von. (70), (265), (270).
 and see Tiscornia, A.
 Grönvall, H. (735).
 Grosse-Schönepauck, H., see Poos, F.
 Grossman, H. P., see Greenwood, A.
 Grosz, E. de. (540), (811).
 Grosz, St. de. (640), (827), (948).
 Grüter, W. (265).
 Grzedzielski, J. (85).
 Guerrieri, G. (168).
 Guha, G. S. (1124).
 Guillery, H. (358), (941).
 Guillot, P. (1141).
 Guist, G., and Seidel, F. (815).
 Gundersen, T. (536), (934), (935), 1111.
 Gut, A. (67).
 Gutmann, J. H. (443).
 Gyorgy, P., see Ray, S. N.
- Haas. (911).
 Habachi, S., see Meyerhof.
 Hackett, C. J. (536).
 Hagedoorn, A. (630), (935), (1145).
 Hahn, W. (1138).
 Halbertsma, K. T. A. (82), (187).
 Hall, A. J. (827).
 Hallum, A. V. (735).
 Hambresin, L. (935).
 and Callewaert, H. (927).
 Hamburger, F. A. (724).
 Hamilton, J. B. (366).
 Handelsman, G., see Rycroft, B. W.
 Handmann, M. (728), (941).
 Hansel, F. K. 526.
 Hanson, W. A., and Fowler, L. H., and Bell,
 E. T. (627).
 Hanumantha Rao, M. V. (1124).
 Hardy, W. F. 902, 1097.
 Hare, W., and Magoun, H., and Ranson, S.
 W. (624).
 Harris, L. J., see Ray, S. N.
 Harris, W. (625).
 Harrison, R. W. (724).
 and Julianelle, L. A. 118.
 and see Julianelle, L. A.
 Hartig, H. 51.
 Hartline, H. K., see Graham, C. H.
 Hartmann, E. 809.
 Hartmann, K. (635).
 Hase, A. (735).
 Havel, J. (77).
 Hay, P. J. (829).
 Hays, H. 1025.
 Heine, L. (367), (1034).
 Heinonen, O. (361).
 Heinsius, E. (275).
 Hemphill, F. M., see Jones, J. G.
 Henham, L. R., see Sorsby, A.
 Henton, H. C., see Burky, E. L.
 Hepburn, N. L. (912).
 Herbert, H. (176).
 Hernandez, I. M., and Lijo Pavier, J., and
 Dusseldorp, M. (265).
 Herrenschwand, F. von. (529).
- Herzog, M. (172).
 Hesky, M. (70), (183), (1124).
 Hesse, E. (820).
 Hicks, A. M., and Hosford, G. N. (60).
 Hildesheimer, S. (1141).
 Hildreth, H. R. 699, 770.
 Hill, E., and Courtney, R. H. 773.
 Hilpert, P. (275).
 Hine, M. L. 519.
 Hippel, E. von. (633).
 Hippert, F. (627).
 Hodgson, H. G., see James, R. R.
 Hoehne, H. (545).
 Hoff, H., and Pötze, O. (351).
 Holley, S. W. (1133).
 Holloway, T. B. 707.
 and Fry, W. E. (1141).
 Holm, E. (352), (445), (942).
 Holst, J. C. (360).
 Holth, S. (172), (921), (921).
 Homma, R. (364).
 Hoorens. (928).
 Hopkins, G. H. 607, 1017.
 Horay, G. (60), (273).
 Horner, W. D. (538), (1122).
 and Bettman, J. 311.
 Horváth, B. (1029).
 Hosford, G. N. (1028).
 and see Hicks, A. M.
 Howard, W. A. (912).
 and see Allen, J. H.
 Hubert, J., and Lebas, J. (353).
 and see Lebas, J.
 Hughes, W. L. 686, (922).
 Huguenin, R., see Renard, G.
 Humbert, R., and Rossano, R. (1041).
 Hunt, G. A. (912).
 Hunt, H. M., see Carey, H. U.
 Hurtault, J., see Moulié, H. B.
- Ibanez Puiggari, M., see Tiscornia, A.
 Igersheimer, J. (821), (1142).
 Imre, J. (79).
 Incze, K. (942).
 and see Nagy, M.
 Inman, W. S. (1046).
 Inouye, T. (528).
 Iribarren, L. A. (825).
 Irvine, A. R. (82), (177), 704.
 Irvine, S. R. (838).
 and Ludvig, E. J. (922).
 Itzikson, see Beresinskaja, D. I.
 Ivanova, E. M. (828).
 and see Awerbach, M.
- Jablonska, Z. (187).
 Jablonski, W., see Motolese, A.
 Jackson, E. 34, 55, 161, 256, 260, 342, (348),
 (352), 431, 522, 807, 907, (922), 1018, 1025,
 1117.
 Jacobson, J. (168).
 Jafe, Z. (719).
 Jaeger, de. (627), (948).
 Jaeger, E. (1043).
 Jalin, M. I. (719).
 James, R. R., and Thomson, St. C., Colledge,
 L., and Hodgson, H. G. (621).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- James, W. M. and Siefker, A. J. 975.
 Jameson, P. C. (452), 689.
 Jancke, G. (70), (815).
 Jayle, G. E., and Mastier, P. (1046).
 Jeandelize, P. (1038).
 and Baudot, and Gault (1142).
 Jeffers, W. A., Griffith, J. Q., Fry, W. E.,
 and Fewell, A. G. 1109.
 Jegorow, I. G. (1050).
 Jenkins, W. H. (627).
 Jensen, C. D. F. (74), (1037).
 Jensen, V. A. (1034).
 Ješe, L. (448), (528), (728).
 Jess, A. (834).
 Johnson, R. 515.
 Johnson, T. H. (823), (1144).
 Johnson, V. M., see Sayad, W. Y.
 Johnston, I. L., see Orr, H. C.
 Joiris, N. P. (74).
 and Fanchamps, J. (360).
 and see Weckers, L.
 Jones, J. G., and Hemphill, F. M., and Pinck-
 ney, J. M. (641).
 Jongbloed, J., see Fischer, F. P.
 Joseph, E. (179).
 Jourdy, P., see Monbrun, A.
 Joy, H. H. (358).
 Joyeux, C., and Sédan, J., and Esménard, J.
 (638).
 Juba, A. (76).
 Julianelle, L. A., and Harrison, R. W. (724).
 and see Harrison, R. W.
 Jusefova, F. I. (449).
 Kadlicky, R. (183).
 Kaganova, O. A., and Cherni, L. I. (627).
 Kahmann, H. (643).
 Kahoun, S. (174), (188).
 Kalt, M. E. (77), (1029).
 Kaminskaia, A. Z. (168), (811), (942).
 Kaplan, J. D. (621).
 Kapuscinski, W. J. (282), (361), (445).
 Karasek, O. (70), (273).
 Karbacher, P. (545).
 Karsch, J. (1040).
 Kasas, I. I. (169), (437).
 Kastrup, M. (641).
 Kattan, M. A. El. (1145).
 Katz, D. (169).
 Katznelson, A. B. (843).
 and see Samoilov, A. I.
 Kayser, B. (719), (1133).
 Kazas, I. I. (64), (834).
 and Kovarskaja, S. S., Krol, A. G., Berman,
 A. H., and Vershavskaja, P. P. (282).
 Keller, J. M. (816).
 Kennedy, W. A. 420.
 Kerby, E. C., see Berens, C.
 Kerr, H. (545).
 and see Leinfelder, P. J.
 Khalil, M. (543).
 Khorazo, D., see Thompson, R.
 Kiehle, F. A. (82), (829).
 Kiep, W. H. (829).
 Kiewe, P. (368), (736).
 and Maneff, I. (87).
 and Reh, J. (816).
 and see Franceschetti, A.
 King, E. F. (1046).
 Kirby, D. B. 1006.
 Kirshman, I. S. (828).
 Kirwan, E. W. O'G. (282), (453), (541),
 (728), (946), (1142).
 Kiseleva, E. H. (528).
 Kissin (Kisin), P. E. (532), (641).
 and Basilevskaja, L. C. (451).
 Kitaeva, A. (177).
 Klauber, E. (180).
 Klauder, J. V., see DeLong, P.
 Kleefeld, G. (355), (641), (912).
 and Leroy, F. (1040).
 Klein, M. (736).
 Klien, B. A. (177), 611, (829), 1014, 1014.
 Klijkova, A. L. (1144).
 Kluever, H. C., and O'Brien, C. S. (825).
 Knapp, A. (453).
 Knobloch, R. (183).
 Koenig, I. J. (730).
 Kogan, E. S., see Zaionchkovski, M. I.
 Kogan, H. D. (534).
 Kogan, K. S. (528).
 Kogan-Abesgus, P. M. (446).
 Kolacny, J. (175).
 Kolen, A. A. (165), (825).
 Kolenko, A. B., see Liorber, G. S.
 Koman Nayar, K. (1136), (1142).
 Kononova, A. V., and Vakker, A. G. (916).
 Kopit, P., see Merkulov, I.
 Kopit, R. Z., see Vinogorov, D. P.
 Kopp, I. F. (444), (536).
 Köppl, A. (82).
 Korenevich, I. (832).
 Korsheniantz, C. F. (728).
 Koslowski, B. (177).
 Kosmin, V. I. (186).
 Kossina, E. G., and Levkoeva, E. F., and
 Pertzeva, V. A. (539).
 Koszutski, B. (283).
 Koval, V. P. (641).
 Kovarskaja, S. S., see Kazas, I. I.
 Koyanagi, Y. (74).
 Koslowski, B. (536).
 Krachmalnikov, L. L. (725).
 Krasnov, M. L. (942).
 Kraupa, E. (349), (360), (545), (816), (1035),
 (1049), (1133), (1138).
 and Mendl, K. (825).
 Krause, A. C. (364), 555, (825).
 Krause, J. (731), (1041).
 Krauss, S. (1126).
 Kravitz, D. 328.
 and Lloyd, R. I. (184).
 Kravkov, C. B. (1126).
 Krebs, A. 336.
 Kreibig, W. (279).
 Kreiker, A. (91).
 Krestin, D., see Cockayne, E. A.
 Krilov, T. K., and Levin, I. S. (635).
 Krinsky, E. (622).
 Krol, A. G. (449), (528).
 and see Kazas, I. I.
 Kronfeld, P. C. (946).
 Krotkov, N. V. (631).
 Kuan, K. P. (536).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Kuda, M. C. (178).
 Kugelberg, I., see Rosengren, B.
 Kulieva, M. X., see Germer, O. I.
 and see Rabinovich, M. G.
 Kunz, E. (267), (1046).
 Kupreev, C. H., and Nisznick, S. A. (444).
 Kurlov, I. H. (631).
 Kurz, J. (189).
 Kurz, O. (943).
 Kyricleis, W. (622). (1035).

 Ladekarl, P. M. (172).
 Lagleyze, P. (935).
 Lagrange, H. (439).
 and Lagrange, A.-M. (165).
 Laird, R. G., see Marshall, D.
 Lamb, H. D. 571, (825).
 Landan, J. (1042).
 Landegger, G. P. 249, 250.
 Landes-Leinerowa, L. (169).
 Langdon, H. M. 1109.
 Langhammerova, R. (190).
 Lapidus, A. M. (622).
 Lauber, H. (74), (1037).
 Lauber, J. (532).
 Law, F. W. 424.
 Lawrence, R. D., and Levy, A. H. (638).
 Lawson, A. (545).
 Lazar, N. K., see Gifford, S. R.
 Lazarescu, D., see Puscariu, E.
 Leavenworth, R. O. 420.
 Lebas, J., and Hubert, J. (367).
 and see Hubert, J.
 Lebensohn, J. E. 110, (543), (718).
 Lech, Jr. (641).
 Lehrfeld, L. 700.
 Leinfelder, P. J., and Kerr, H. D. 739.
 and O'Brien, C. S. (83).
 Lence, S. (912).
 Lennon, R. C. (635).
 Lenzen, A. F., and Gradle, H. S. 615, 665, (930).
 Leplat, G. (1044).
 Leroy, F., see Kleefeld, G.
 Levin, I. S., see Krilov, T. K.
 Levine, J. (83), 164, (169).
 Levinsohn, G. (352), (532).
 Levkoeva, E. F., see Chechik-Kynina, E. A.
 and see Kossina, E. G.
 Levy, A. H., see Lawrence, R. D.
 Lewis, A. C. 335.
 Lewis, P. M. 250, 251, 251, 1115.
 Lichtner, V. A. (449).
 Liebermann, L. (169).
 Lijo Pavia, J. (70), (70), (83), (273), (273), (348), (736), (828), (912), (922).
 and Dusseldorp, M. (64), (273).
 and see Hernandez, I. M.
 and see Victoria, M.
 Lindner, K. (263), (816).
 Linksz, A. (728).
 Liorber, G. S., and Kolenko, A. B. (622).
 Lipovich, H. C., and Sher, A. I. (528).
 Lipschutz, H. (173).
 Litauer, R. (935).
 and see Galewska, S.
 Litinskii, G. A. (722), (1122).

 Livingston, P. C. 252.
 Lloyd, J. P. F., see Currie, J. G. D.
 Lloyd, R. I. 216, (440), (837).
 and see Kravitz, D.
 Lobeck, E. (736).
 Lobel, A. (725).
 Lo Cascio, G., and Friedmann, G. (1126).
 Lockwood, C. 156.
 Lokshina, S. I. (821).
 López Enriquez, M. (718), (1142).
 Lourie, O. R. 345, 1121.
 Löwenstein, A. (273), (440), (1133).
 Lubimov, A. A. (186).
 Lucic, H. (943).
 Luckiesh, M., and Moss, F. K. 992.
 Ludvigh, E. J. 292.
 and see Irvine, S. R.
 Ludwig, A. (65), (79).
 Luedde, W. H. 245, 338, (718).
 Lugli, L. (64), (182).
 and see Biatti, G. B.
 and see Biozzi, G.
 Lux, P., see McLeod, J.
 Luzinskii, R. F. (719).
 Lyle, D. J., and McGavic, J. S. 316.
 Lyon, M. 702.
 Lyzinskii, G. F. (187).

 MacCallan, A. F. (725), (930).
 MacDonald, A. E. (832).
 Machlin, I. M. (529).
 Macht, D. I. 324.
 MacMillan, J. A., see Byers, W. G. M.
 and see Penfield, W.
 MacRae, A. (935), (935).
 Madroszkiewicz, M. (922).
 Maestro, T. (267).
 Magitot, A., and Tille, H., and Dubois-Poulson. (537).
 Magnus, J. A. (1145).
 Magoun, H. W., see Hare, W.
 Mählén, S. (367).
 Mahoney, W., and Sheehan, D. (631).
 Maia, J., see Busacca, A.
 Maisler, S., see Barkan, O.
 Majewski, K. (837).
 Makulski, see Cholina, A. A.
 Malbran, J. (86), (267), (276), (946).
 and Carrillo, R. (276).
 and see Adrogué, E.
 and see Balada, M.
 and see Soriano, F.
 and see Soriano, S.
 Malmberg, M., see Euler, H.
 Mamedov, E. (936).
 Mamola, P., and Bellino, G. (1035).
 Manas, R. M., see Ramirez Corria, C. M.
 Maneff, I., see Kiewe, P.
 Manes, A. J. (270), (271).
 Maniukova, H. K. (817).
 and Cerebranni, Z. M. (917).
 Mankovetzki, S. I., see Gastev, A. A.
 Mann, I. (274), 424, (543), (622).
 Mann, W. A., Jr. (543).
 Mans, R. (366).
 Marbaix. (943).
 Marble, A., and Smith, R. M. (546).

NAME INDEX

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Marchesani, O., and Stauder, K. H. (71).
 Marchesini, E. (177).
 and Ghio, A. (166).
 Marcove, M. E. 900.
 Marcus, I., and Youdkevich, D. (817).
 Marin Amat, M. (725).
 Markiewicz, S. (175), (811), (936).
 Markus, I. M., see Marcus, I.
 Marmalevski, K. V. (177).
 Marmorstein, F., see Merkulov, J.
 Marquez, (79).
 Marquez, M. (89), (353), (533), (720), 1024.
 and Velilla, (178).
 Marquis, D. G. (625).
 Marshall, D. (722), (922).
 and Laird, R. G. 1085.
 Marshall, J. C. 252, 618.
 and see Greeves, R. A.
 Martell, P. (88).
 Martin, P. 518.
 Martin, W. O., Jr. 434.
 Martinov, V. F., see Sharkovskii, I. A.
 Martzinkovskii, A. P., see Velter, S. L.
 Martzlin-Uroda, M. S. (837).
 Marucci, L. (188).
 Mason, R. E. 339, (641).
 Maslennikova, H. T., see Emilianov, P. A.
 Mastier, P., see Jayle, G. E.
 Mata Lopez, P. (639).
 Maury, F. H. 866.
 Maust, E. C., see Sayad, W. Y.
 Mawas, J. (1143).
 Mayer, L. L. 58, (166), (169).
 and see Boshes, B.
 Mayer, M., see Biffis, A.
 Mayou, S. (928).
 McAdams, W. R., see Beach, S. J.
 McCannel, A. D. 1111.
 McClanahan, R. 418.
 McCool, J. L. (439).
 McGavic, J. S., see Lyle, D. J.
 McIntyre, R. T. 1113.
 McKay, E. C., see Berens, C.
 McKee, S. H. (358).
 McLeod, J., and Lux, P. (828).
 Mecca, M. (1035), (1042).
 Meighan, S. S. (737).
 and Urquhart, M. (725).
 Meksina, F. M. (439).
 Melanowski, W. H. (169), (283), (1027).
 Melchior, A. (453).
 Melik-Musian, B. H., and Mesropian, E. I. (729).
 Mēlka, J., see Gala, A.
 Melkin, B. M. (834).
 Meller, J. (267), (943), (943).
 Melo, G. de., Jr. (87).
 Mendl, K., see Kraupa, E.
 Menezo, J. M. (635).
 Mengel, W. G. 512.
 Mengert, W. F., see Thygeson, P.
 Menshutin, M. A., see Ochapovskii, S. V.
 Merkulov, I. (830), (917), (1124).
 and Kopit, P. (817).
 and Marmorstein, F. (917).
 Merrill, H. G. 1007.
 Mesropian, E. I., see Melik-Musian, B. H.
 Messinger, H. C. 516.
 Mexina, F. M. (718).
 Meyer, G. P., see Adler, F. H.
 Meyer, K., and Palmer, J. W. 859.
 Meyer, S. J., see Gradle, H. S.
 Meyerbach, F. (1143).
 Meyerhof, M., and Habachi, S. (535).
 Meyer-Waldeck, F. (65).
 Michaelson, I. C. (931).
 Michail, D. (368).
 and Benetato, G. (821).
 Middleton, A. B. (449).
 Mieses-Reif, M. (1044), (1047).
 Meir, L., and Rivas Cherif, M. de. (83).
 Miller, N., see Mowrer, O.
 Miloro, A. (269).
 Miranda, A. G. (722).
 Mirto, F., see Bellavia, A.
 Miterstein, B. (79).
 Mitzkevich, L. D. (729), (931).
 Miyashita, S. (283).
 Mkrticheva, L. I., see Neustadt, I. E.
 Mocchi, V., see Rossi, F.
 Mohamed, I. A. (435), (444).
 Mohan Lal, A. (1138).
 Molina, T. (76).
 Möller, H. U. (364).
 and Blegvad, O. (726).
 and see Blegvad, O.
 Monbrun, A., and Regnier, J., and Jourdy, P. (917).
 Montlaur, H. (89).
 Moore, Foster, see Moore, R. F.
 Moore, R. (173).
 Moore, R. F. (633).
 Morard, G., see Toulant, P.
 Morax, V. (817).
 Moreu, A. (71), (537).
 Moron, D. J. (731).
 Morreti, E. (269), (276), (277), (277), (1041).
 Morse, A. W. 40.
 Moscardi, P. (268).
 Moss, F. K., see Luckiesh, M.
 Mossa, G. (189), (348).
 Motolese, F. (731).
 and Jablonski, W. (59).
 Moulie, H. B., and Hurtault, J. (275).
 Mowrer, O., Ruch, T., and Miller, N. (1128).
 Much, V. (821).
 Mukerjee, S. K. (1133), (1143).
 Müller, H. K. (67), (271), (361), (367), (812).
 and Rintelen, F. (268).
 Mura, F. (68).
 Murphy, F. G. 151.
 Musabelli, I. (1036).
 Muselevich, A. L., and Zundeleovich, P. I., and Fradkina, M. I. (173).
 Muthayya, R. E. S. (1134).
 Nagy, M., and Incze, K. (817).
 Nanavati, B. P., see Duggan, J. N.
 Narayanaswami Nayudu, G. J. (1134).
 Narayanaswami Pillai, V. (1130).
 Narog, F. (169), (837).
 Nastri, F. (185), (639), (1125).
 Nataf, R., see Cuénod, A.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Natale, A. (279).
 Natanson, D. (283).
 and Peisachovich, I. M., and Vinogorov, D. P. (190).
 and Winogradov, D. P. (1049).
 Nayar, K. K., see Wright, R. E.
 Nazarov, V. (88).
 Neame, H. 424.
 Neher, E. M. (838).
 Németh, L. (936).
 Nesi, V. (1029).
 Neuman, J. (280), (628), (635).
 Neustadt, I. E., and Shubova, T. B., and Mkrlicheva, L. I. (641).
 Newton, F. H. (179), 600.
 Niederhoff, P. (912).
 Nikolajeva, M. C., see Churgina, E. A.
 Nilson, E. L., see Berens, C.
 Nisznik, S. A., see Kupreev, C. H.
 Nitzulescu, J., see Puscariu, E.
 and see Triandaf, E.
 Nižetić, Z. (86), (729), (931).
 Nizsetich, Z., see Nižetić, Z.
 Noel, see Perrin, R.
 Noelle-Chomé-Bercious. (1143).
 Nordmann, J., and Payeur, P. (913).
 Nowkirischky, A. D. (268).
 Nugent, O. B., and others. (543).
 Obregon Oliva, R., see Urrets Zavalía, A.
 O'Brien, C. S. (182), 432, (812), (1027).
 and see Kluever, H. C.
 and see Leinfelder, P. J.
 Ochapovskaja-Patzapai, H. V. (444).
 Ochapovsky, S. V. (173).
 and Menshutín, M. A., and Sharkovskii, I. S. (821).
 and Sharkovskii, I. A. (178).
 Ochi, S. (61).
 Ochsner, E. H. 344.
 O'Connor, R. (354), (1128).
 Ohm, J. (722), (1128).
 Ohmart, W. A. 900.
 Olsho, S. L. 894.
 Olsson, G. F. (358).
 Onisi, Y. (1130).
 Opin, and Reboul. (357).
 Orr, H. C., and Johnston, I. L. (189).
 and Young, J. H. (818).
 O'Rourke, D. H. (173).
 Orth, H. (280).
 Ostwalt. (922).
 Orzalesi, F. (189), (265), (271), (274), (280).
 and see Focosi, M.
 Osterberg, G. (455).
 Ostroumov, V. M. (191).
 Ourgaud, G., Sédan, J., and Roux, A. (946).
 Pajtas, J. (729), (729).
 Pallares Lluesma, J. (68), (830).
 Palmer, J. W., see Meyer, K.
 Palmieri, C. (1028).
 Palmieri, L. (68).
 Pameijer, J. K. (266).
 Panico, E. (61), (188), (278), (348).
 Panton, P. N. (546).
 Paparcone, E. (435), (453).
 Paradoksov, L. E. (435).
 Parchamenko, M. E. (184).
 Park, G. E. (928), 967.
 Parlato, S. J. (178).
 Parsons, J. (352).
 Pascal, J. I. (173).
 Pascheff, C. (184).
 Pashkovskii, V. M. (435).
 Paton, L. 609, (622), (821).
 Paton, R. T., and Auchincloss, S. S., Jr. (922).
 Patriarca, A. P. (78).
 Payeur, P., see Nordmann, J.
 Peet, M. M., see Fralick, F. B.
 Peisachovich, I. M., see Natanson, D. M.
 Penfield, W., and Evans, J. P., and Mac-Millan, J. A. (625).
 Pereira, R. F. (71), (71), (1138), (1143).
 Perera, C. A. (180), (453).
 Pereyra, G. (170).
 Perez Bufill. (79).
 Perez Llorca, J. (91).
 Pergola, A. (1042), (1123).
 Perrin, R., and Noel. (446).
 Pesme, P. (1143).
 Pertzeva, V. A., see Kossina, E. G.
 Peter, L. C. (354), (722), 908.
 Petragani, V. (633), (737), (1145).
 Petri, M. de. (78).
 Petrov, A. A. (636).
 Petrunia, S. P. (729).
 Pfeiffer, R. L. (830), (1043).
 Pfimlin, R., and Strübin, F. (59).
 Pfingst, A. (1040).
 Pflugk, A. (59).
 Pfunder, M. C. 1009.
 Pickard, R. (357), (1037).
 Picoli, H. R., see Soriano, F. J.
 and see Soriano, J. S.
 Piekarska-Maczynska, M. (623).
 Pierce, H. F., see Friedenwald, J. S.
 Pierguidi, C. (277).
 Pillat, A. (944), (1143).
 Pilman, H. (837).
 and Taradina, H. A. (623).
 Pinckney, J. M., see Jones, J. G.
 Pinkerton, F. J., and Cowan, T. W. 44, 45.
 Pipkina, L. I. (449).
 Pischel, D. K. 795.
 Plastinin, H., see Beresinskaja, D. I.
 Pletneva, H. A., and Fradkin, M. I. (530).
 Pletzer, F. O. (631).
 Plitas, P. C. (449), (636), (636).
 Plonske, C. J. 1009.
 Podestà, H. (1126).
 Pokrovsky, A. (826), (830).
 Pol, W. (174).
 Polacco, A. (720).
 Polack, A. (922), (1143).
 Poliak, A. (923).
 Poliak, G. D. (88).
 Poljak, S. 157, (455), (838).
 Poos, F. (170), (276), (437).
 and Grosse-Schönepauk, H. (529).
 Poos, G. 903.
 Porto, G. (628).
 Posner, A. (180).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Possenti, G., and Castrignani, G. (175).
 Post, L. T. 56, 162, 257, 343, 521, 617, 712, 715, 808, 907, 1021, 1118.
 Post, M. H. 222, (532).
 and see Charles, J. W.
 Posthumus, R. G. (726).
 Pötzl, O., see Hoff, H.
 Poulard, A. (628).
 Poursines, Y., see Frogé, P.
 Pratt, F. J. 514.
 Prevec, S. (737).
 Prigoshena, A. (59), (1144).
 Promotov, A. A. (530).
 Promtov, V. A. (170), (917).
 Propper, H. I. (643).
 Protopopow, B. V. (537), (636).
 Pugh, M. A. 714.
 Puglisi-Duranti, G. (64), (71), (268), (936), (1144).
 Puiggari, M. I., and Adrogué, E. (1029).
 Pulvertaft. (726).
 Purtscher, E. (623).
 Puscariu, E. (1041), (1043).
 and Nitzulescu, J. (1138).
 Puscariu, H., and Lazarescu, D. (62).
 Quint. (636).
 Rabinovich, M. G. (180), (180).
 and Kulieva, M. X. (191).
 Rabinovitz, M. G., see Rabinovich, M. G.
 Rabkin, E. B. 1120.
 Raffo, L. A., see Rodriguez, B.
 Raza Iyer, D. (1134).
 Ralli, E. P., and Gresser, E. B., and Flaum, G. (64).
 Rameev, P. C. (436), (537).
 Rameev, R. C. (642), (729).
 Ramirez Corria, C. M., and Cuervo, L. V., and Manas, R. M. (812).
 Rand, G., see Ferree, C. E.
 Rangachari, V. (1130), (1134).
 Rankin, C. A. 512.
 Ranson, S. W., see Hare, W.
 Rapisarda, D. (1047).
 Rasmussen, O. D. (923).
 Rauh, W. (1138).
 Raverdino, E. (71), (1029).
 Ray, S. N., and Gyorgy, P., and Harris, L. J. (361).
 Rea, R. L. (733).
 Reboul, see Opin.
 Rechniewski, C., see Damel, C. S.
 Redslob, E. (1039).
 and Reiss, P. (180).
 Reese, A. B. 576, (818).
 Reese, F. M. 780.
 Reese, W. S. 48, 153.
 Refatullah, M. (1125).
 Regnier, J., see Monbrun, A.
 Reh, J., see Kiewe, P.
 Reichling, W. (274).
 Reiners, H., see Rohrschneider, W.
 Reis, W. (89), (642).
 Reiser, K. A. (91), (812), (838).
 Reiss, P., see Redslob, E.
 Renard, G., and Huguenin, R., and Cassiau, P. (830).
 Renedo, J. M. (443), (823), (832).
 Rezende, C. de. (1134).
 Riad, M. (1047).
 Rice, C. E. 1, 428.
 Richman, F. 792.
 Richner, H. (546).
 Riddell, L. A. (913).
 Riddoch, G. (625).
 Ridley, H. (441).
 Riedl, F. (75), (80).
 Rieth, H. (634), (731).
 Ringle, C. A. 427.
 Rintelen, F. (72), (446), (628).
 and see Müller, H. K.
 Riseman, B. 704.
 Riser, R. O. 155, 155, 613.
 Rivas, J. de la T., see Castelao, M. A.
 Rivas Cherif, M. de. (166).
 and see Mier, L.
 Robbins, A. P. (175).
 Roberto, S. (1050).
 Roberts, W. H. 43.
 Robertson, C. J. (453), (923).
 Robertson, E. B., see Duke-Elder, W. S.
 Roche, C., and Roux, A. (1029).
 Rochon-Duvigneaud, A. (89).
 Rodin, F. H. 597, (1139).
 Rodriguez, B., and Raffo, L. A. (1127).
 Rodstein, C. D. (726).
 Roelofs, C. O. (352).
 Rohrschneider, W. (440), (636).
 and Reiners, H. (1047).
 Rolett, D. M. (173), 888.
 Rolf, D. E. 259.
 and see Bothman, L.
 Rollet, J. (828).
 Rollin, J. L. (80), (828).
 Rolufs, L. S., see Bengtson, I. A.
 Rosanova, E. P., see Grazianskaia, L. H.
 Rosenbaum, M. 1101.
 Rosenblum, M. E. (818).
 Rosengren, B. (348).
 and Kugelberg, I. (444).
 Rosenstein, A. (826).
 Rossano, R., see Humbert, R.
 Rossel, S. I., see Fradkin, M. I.
 Rossi, F., and Mocchi, V. (284).
 Rossi, G. (530), (918), (1044).
 Rostkowski, L. (454).
 Rothert, K. (946).
 Roux, A., see Ourgaud, G.
 and see Roche, C.
 Roulet, E., see Franceschetti, A.
 Rowland, W. D. 698, 704.
 Rubbrecht, R. (364), (364).
 Rubert, I. I. (931).
 Rubino, A. (68), (271), (733), (913), (1037), (1135).
 and see Alajmo, B.
 Ruch, T., see Mowrer, O.
 Rugg-Gunn, A. 52, 251.
 Rumiantzeva, A. F. (179), (443), (628).
 Rundles, W. (1139).
 Rusk, H. S. 606, 607.
 Rutherford, C. W. (913).
 Rutherford, W. J. (283).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Rychener, R. O. 251, 1114, 1115.
 Rycroft, B. W. (918).
 and Handelsman, G. (936).
 Sabata, J. (80), (191).
 Sabbadini, D. (72).
 Saburov, G. I. (729).
 Sáenz-Alonzo, R. (80).
 Saidakovskii, A. C. (637).
 Saint-Martin, de. (928).
 Sala, G. (86), (1047).
 and Borsellino, G. (639).
 Sales, M. (88), (723), (726).
 and see Burnier, P.
 Salit, P. W. (271).
 Salzmann, M. (75), (634).
 Samoilov (Samojloff), A. (174), (720), (918).
 and Katznelson, A. B. (918).
 and Tichomirova, A. (438).
 Samsonova, T. I. (449).
 Samsonowa, V. G. (532).
 Samuels, B. (454), 493, (539), (642), 708,
 (832), (839).
 Samuelson, A. (931).
 Sanctis, E. de. (266).
 Sanctis, G. E. de (937), (1036), (1044).
 Sanyal, S. 982.
 Sapir, I. (436).
 Saralegui, A. F. (78).
 Sarrouy, see Toulant.
 Sattler, C. H. (928).
 Satyanatham Pillai, A. (1130), (1135).
 Savelev, S. V., see Saveliev, S. V.
 Saveliev, S. V. (623), (826).
 Savin, L. H. (184).
 Sayad, W. Y., and Johnson, V. M., and
 Maust, E. C. (449).
 Scala, N. P., and Spiegel, E. A. (625), (823).
 Scalinci, N. (1049).
 Scarlett, H. W. 153.
 and see Strumia, M. M.
 Scheerer, R. (530), (642).
 Scheglova, A. A. (720).
 Schiff-Wertheimer, see Baillart.
 Schmelzer, H. (266), (441).
 Schmid, E. (451).
 Schmidt, I. (720).
 Schmidt, R. (263).
 Schmoulian, L. P., see Filatov, V. P.
 Schneider, C. O. (628).
 Schneider, R., see Schneider, C. O.
 Schoen, Z. J., and Wallace, S. R., Jr. (923).
 Schoenberg, M. J. (718), (1123).
 Schreiber, Z. (86).
 Schroeder, H. (68).
 Schweinitz, G. E. de. (454).
 and Fewell, A. G. 801.
 Schupfer, F. (441), (737), (1123).
 Schwartz, F. O. 511.
 Schwartz, K. (634).
 Schwartz, L. H. (913).
 Schwartz, V. J. 52, 52, (281), 1006.
 Sciortino, S. E. (348).
 Scullica, F. (266), (626).
 Sédan, J. (727), (944).
 and see Joyeux, C.
 and see Ourgaud, G.
 Seefelder, R. (937).
 Seidel, E. (543).
 Seidel, F., see Guist, G.
 Selinger, E. (68), (530), (623).
 Sellas, Jr. (637).
 Sen, K. (1125), (1144).
 Sená, J. A. (89), (283).
 Sengstack, J. L. (637).
 Sergeev, H. V. (529).
 Sergieva, M. (631).
 Sergievskii, I. I. (834).
 Serr, H. (821).
 Settel, N., see Gatewood, W.
 Sexe, J. (454).
 Shadskaja, O., see Disler, H. H.
 Shamullov, B. H., see Volokononko, A. I.
 Shankara Menon, K. C. (1139).
 Shankel, H. W., see Bane, W. M.
 and see Walker, C. E. Jr.
 Shannon, C. E. G. 49.
 Shapira, T. M. (178).
 and Crage, F. M. 891.
 Shapiro, P. H., see Birich, T. V.
 Shapland, C. D., and Greenfield, J. G. (634).
 Sharkovskii, I., and Martinov, V. F. (184).
 and see Ochapovsky, S. V.
 Sharpley, F. W. (533).
 Sheard, C., see Albers, E. C.
 Sheehan, D., see Mahoney, W.
 Sheppard, E. 804.
 Sher, A. I., see Lipovich, H. C.
 Sherman, A. R. (532).
 Sherman, G. C. (637).
 Shimkin, N. I. (90).
 Shipman, J. S. 1110.
 Shivarova, E. D. (441), (539).
 Shoji, Y. (924).
 Shubova, T., see Neustadt, I. E.
 Sicharulidze, I. A. (436).
 Sidwell, C. E. 427.
 Siefker, A. J., see James, W. M.
 Siegert, P. (65), (947).
 Silber, D. A. (721).
 Silverstone, S. M., see Globus, J. H.
 Simon, I. (349).
 Simpson, W. M., see Culler, A. M.
 Sitzimkopfora, H. (170).
 Sizov, M. I. (924).
 Sjögren, H. (356), (356), (446).
 Skirball, J., and Thurmon, F. (1038).
 Slavik, B. (185).
 Slavin, L. D., see Fradkin, M.
 Sloan, L. L., see Walsh, F. B.
 Slonimski, S. L. (826).
 Smaltino, M. (65), (271), (721), (1043).
 Smart, F. P. (924).
 Smith, F. W. G. (1044).
 Smith, H. (539).
 Smith, R. M., see Marble, A.
 Smolerooff, J. W., and Agatston, S. A. (446).
 Smoljaninov, L. I. (437).
 Sniakin, P. G. (166).
 Sobańskii, J. (541), (718), (818), (821), (913),
 (947), (1144).
 Sogolova, E. I. (918).
 Soliman, A. M. (1048).
 Solovieva, M. K. (638).

Explanation: Numbers in heavy type refer to original articles, parenthetical numbers to abstracts

- Soria, M. (62), (80).
 Soriano, F. J., and Malbran, J., and Piccoli, H. R. (1038).
 and Picoli, H. R. (280).
 Soriano, J. S., and Malbran, J. (822).
 and Picoli, H. R. (274).
 Sorsby, A. (454), (822).
 and Henham, L. R. 1012.
 and see Cockayne, E. A.
 Soudakoff, P. S. (831).
 Sourdille, G. P. (812), (1030), (1030).
 Spaeth, E. G. 48, 154, 320, (365), 901.
 Spangol, V. (835), (919).
 Spanyol, V., see Spangol, V.
 Spector, S. A. (443), (835).
 and Chvorov, V. V. (75).
 Spiegel, E. A., see Scala, N. P.
 Spiesman, I., see Gellhorn, E.
 Spratt, C. N. 422, 515, 601.
 Springowitsch, G. (623).
 Srinivasan, E. C. (1123).
 Stallard, H. B. (83).
 Stankiewicz, Z. (637).
 Stark, A. (539).
 Starodubtzeva, A. I. (437), (539).
 Stastnik, E. (178).
 Stauder, K. H., see Marchesani, O.
 Sterenberg, M. A. (437).
 Stevens, C. L. 593.
 Stevenson, E. (919).
 Stewart, F. H. (436).
 Stiehler, R. D., see Friedenwald, J. S.
 Stilo, A. (1050).
 Stine, G. H. 608, (737), 798, 799, 800.
 Stocker, F. (729).
 Storchheim, F., and Taube, E. L. 508.
 Storts, B. P. (535).
 Strachov, B. P. (69).
 Strampelli, B. (69), (166), (185), (1036).
 Strebel, J. (59), (60), (264), (436), (438), (642), (733), (838), (929).
 Streiff, J. (1036).
 Stroobant, C. (1048).
 and see Coppez, H.
 Strübin, F., see Pfimlin, R.
 Strumia, M. M., and Scarlett, H. W. (535).
 Suganuma, S. (441).
 and see Uyemura, M.
 Sugita, Y. (357), (818).
 Sundqvist, M. (532).
 Swerdfeger, E. B. 800.
 Swett, W. F. 247, 796.
 Swigert, J. L. 897.
 Szer, R., and Zachert, M. (176).
 Szily, A. von. (62), (86), (264).
 and Machemer, H. (441), (818).
 Szymanski, J. (188).
 Szymanowski, K. (454), (533).

 Takats, G. de, and Gifford, S. R. (185).
 Talkovskii, S. I. (170), (944).
 Tang, F. F., and Chou, C. H. (726).
 Taradina, H., see Pilman, H. I.
 Taube, E. L., see Storchheim, F.
 ten Doesschate, G., see Weve, H. J. M.
 Terlinck, J. (947).
 Terrien, F., Veil, P., and Dollfus, M.-A. 1119.

 Terry, T. L. 1105.
 Terson, A. (1030).
 Tertsch, R. (72), (354).
 Theobald, G. D. (91), (369), 1111.
 Thiel, R. (732).
 Thomas, J. W. T. (937), (937), (937).
 Thompson, A. H., see Willoughby, G. T.
 Thompson, R., and Gallardo, E. 684.
 and Khorazo, D. 852.
 Thomson, St. C., see James, R. R.
 Thorpe, H. E. (637), (833).
 Thurmon, F., see Skirball, J.
 Thygeson, P. 517, 614, 649.
 and Mengert, W. F. (932).
 Tichomirov, P. E. (80), (440), (445), (823).
 Tichomirova, A. A. (938).
 and see Samoilov, A.
 Tichonravova, T. H. (733).
 Tichvinskii, B. (191).
 Tidy, H. L. (546).
 Tille, H. (639).
 and see Magitot, A.
 Tillema, A. (637).
 Tillim, S. J. (642).
 Tiscornia, A., Ibanez Puiggari, M., and von Grolman, G. (443).
 Tita, C. (264), (1048).
 Tkatschow, W. P., see Towbin, B. G.
 Tobgy, A. F. (445), (1145).
 and see Wilson, R. P.
 Tomilova, A. F. (191).
 Tooke, F. T. (358), (1027).
 Tooker, C. W. 429.
 Torgersrud, T. (446).
 Toulant, P., and Morard, G. (938), (945).
 and Sarrouy. (1048).
 Towbin, B. G. (537).
 and Tkatschow, W. P. (1130).
 Trainor, M. E. 703, (1042).
 Trantas, A. (533).
 Trapezontzeva, E. (727), (1131).
 Traquair, H. M. (541).
 Trattner, S. (1045).
 Travers, T. à B. 258, (534).
 Trematore, M. (932), (1030).
 Triandaf, E., and Nitzulescu, J. (639).
 Tristaino, L. (264), (267), (1144).
 Tron, E. (924).
 Troncoso, M. U. (180), 716, 908, 909.
 and Castroviejo, R. 371, 481, 583.
 and Givner, I. E. 549.
 Trovati, E. (269), (643), (831).
 Trubin, A. (730).
 Tschekina, A. H. (828).
 Tschermak-Seysenegg, A. (352).
 Tumarkina, M. A. (938).
 Tumiantzev, H. F. (541), (541).
 Turner, H. H. 336.
 Tyrrell, S. M. (1049).
 Tzikulenko, K. I., see Zykulenko.
 Tzirlin, B. A., see Vishnevskii, H. A.

 Uchida, T. (1131).
 Uriarte, A. B. (76).
 Uribe Troncoso, M., see Troncoso, M. U.
 Urquhart, M., see Meighan, S. S.
 Urrets Zavalía, A., and Balado, M., and

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Obregon Oliva, R. (629).
 and Obregon Oliva, R. (84).
 Usher, C. H. (1049).
 Uyama, Y. (537), (620), (819).
 Uyemura, M. (620).
 and Suganuma, S. (913).
- Vail, D. (544).
 Vajda, G. v. (812).
 Vakker, A. G., see Kononova, A. V.
 Valichan, C. (945).
 Vampré, E. (626).
 Van Bogaert, L. (1036).
 Vancea, P. (639).
 Van Cleve, E. M. (283).
 Van der Straeten and Appelmans. (62), (356), (932), (932), (932).
 Van Duyse, M. (362).
 and Canneyt, (1045).
 Van Heuven, J. A. (365).
 and Fischer, P. F. (623).
 Van Lint. (369), (949).
 Wauters, M. (913).
 Vannas, M. (269), (838).
 Veasey, C. A. 332.
 Veil, P., and Dollfus, M.-A. (365), (1037).
 and see Terrien, F.
 Vejdovsky, V. (75).
 Velhagen, K., Jr. (441), (835), (925), (925), (925).
 Velilla, see Marquez.
 Velter, S. L., and Martzinkovskii, A. P. (938).
 Venco, L. (949).
 Vengrjenovsky, G. S. (80).
 Vercelli, G. (819).
 Verhoeff, F. H. 46, 158, (530), 715, (914), (919), (1128).
 Vermeulen, D., see Fischer, F. P.
 Verrey. (938).
 Verrier, M. (839).
 Vershavskaja, P. P., see Kazas, I. I.
 Viallefont, H. (547).
 and Diacono, E. (282).
 Vianna, A. M. (349).
 Victoria, M., and Lijo Pavia, J. (547).
 Vidauer, M. (624).
 Vila-Coro, A. (839), (839).
 Vila Ortiz, J. M., Jr. (62).
 Villani, G. (66).
 Vinaver, L. C. (730).
 Viner, K. G. (620).
 Vinogorov, D. P., and Kopit, R. Z. (833).
 and see Natanson, D. M.
 Vinsonhaler, F., and Cosgrove, K. W. (544).
 Vishnevskii, H. A., and Tzirlin, B. A. (925).
 Visser-Heerema, J. (819).
 Viswalingam, A. (1135).
 Vita, A. (925).
 Vito, P. (84), (264), (274), (1127), (1131).
 Vittadini, A. (281), (440), (1050).
 Vogt, A. (365), (442), (442), (450), (812).
 Volochov, A., and Gerschuni, G., etc. (75).
 Volokononko, A. I. (283), (932).
 and Shamuiloov, B. H. (530).
 Von Bahr, G. (1030).
 Vormann. (1045).
- Vos, T. A. (839).
 Vosnesenskaja, A. L., see Gastev, A. A.
- Wagner, R. (187).
 Waite, J. H. 158, 1112.
 Wald, G. (629).
 Waldmann, B. (358).
 Walker, C. 158.
 Walker, C. E., Jr. 428, 794, 898, 898.
 and Bane, W. M., and Ravin, A. 899.
 and Shankel, H. W. 899.
 and see Danielson, R. W.
 Walker, C. B. 392, 558, (621), (819), (819), (820).
 Walker, J. P. S. (1123).
 Wallace, S. R., Jr., see Schoen, Z. J.
 Walsche, L. de. (447).
 Walsh, F. B. (366).
 and Sloan, L. L. 195, (366).
 Warburton, F. L. (353).
 Wauters, M., see Van Lint.
 Weed, L. H. (626).
 Weekers, L. (72), (945), (1037), (1037).
 and Fanchamps, J. (1028).
 and Joiris, P. (1043).
 Weeks, W. W. (812).
 Weinstein, P. (88).
 Weintraub, J. D. (174).
 Wernicke, O. (447).
 Wescott, V. 385.
 Weskamp, C., and Alvarez, C. (826).
 Weskamp, R. L. (73).
 Wetzel, J. O. 1053.
 Weve, H. J. M. (366), (820).
 and ten Doesschate, G. (90).
 Whalman, H. F. (185), 885.
 Wheeler, J. M. (78).
 White, J. W. 653, (723), 803.
 Wieczorek, A. (187), (450), (629).
 and see Biernacka-Biesiekiarska, J.
 Wiedersheim, O. (531).
 Wiegmann, E. (631), (733).
 Wilczek, M. (181).
 Wilder, H. C., see Callender, G. R.
 Wilenkin, M. (438), (1123).
 Williams, H. J. (629).
 Williamson-Noble, F. A. (1127).
 Willie, W. A. (732).
 Willoughby, G. T., and Thompson, A. H. 53.
 Wilson, J. A. (174).
 Wilson, R. P., and Tobgy, A. F. (451).
 Winckler, G. (1050).
 Winogradov, D. P., see Natanson, D. M.
 Wittels, L. (181).
 Wojno, Z. (356).
 Wolfe, O., and Blaess, M. J. 400.
 Wolff, E. 53, (822).
 Wölflin, E. (813), (914).
 Wolfson, S. L. see Beresinskaja, D. I.
 and see Feldman, A. I.
 Wood, D. J. (1135).
 Woodruff, F. E. 339.
 Woodruff, H. W. 146, (733).
 Woods, A. C. 9, 100, (360).
 Woods, R. H. 337.
 Wooton, H. W. (454).
 Worms, G. (823).

Explanation: Numbers in heavy type refer to original articles, parenthetical numbers to abstracts

Wostry, M. (84).
Wright, R. E. (366), 413, (939), (1139).
 and Nayar, K. K. (938).
Wright, W. D. (533).
Wüllenweber, G. (73).
Würdemann, H. V. (277), 457.
"X." (443).
Yalour, R. R., see Balza, J.
Yanes, T. R. (718), (914).
Yaskin, J., see Alpers, B.
Yater, W. M. 302.
Youdkevich, D., see Marcus, I.
Young, G. (939).
Young, J. H., see Orr, H. C.
Yudkin, A. M., and Arnold, C. H. (362),
 (1031).

Yver and Barrat. (86).
Zabugin, K. A. (284).
Zachariah, G. (1128).
Zachert, M. (643).
 and see Szer, R.
Zahor, A. (90), (90).
Zaionchkovski, M. I., and Kogan, E. S. (537).
Zamkovskii, I. G. (914).
Zappalà, A. (350).
Zentmayer, W. 47, 801.
Ziporkes, J. (537).
Zirlin, B., see Tzirlin, B. A.
Zitowskii, M. L. (187).
Zolotnitskii, I. H. (639).
Zundevich, P. I., see Muselevich, A. L.
Zur Nedden. (275).
Zykulenko. (438).

SUBJECT INDEX

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Abducens, congenital paralysis of, (1127).
 Abscess, of cornea, (177).
 annular, (536).
 lacrimal, (75).
 of lens, (86).
 of lid, therapy, (1041).
 of orbit, (187), (1039).
 Abstracts—
 1. General methods of diagnosis, (165), (347), (527), (717), (910), (1122).
 2. Therapeutics and operations, (167), (349), (529), (718), (914), (1123).
 3. Physiologic optics, refraction, and color vision, (59), (171), (350), (531), (718), (919), (1125).
 4. Ocular movements, (60), (174), (353), (533), (721), (926), (1127).
 5. Conjunctiva, (60), (175), (263), (354), (435), (534), (723), (929), (1128).
 6. Cornea and sclera, (62), (176), (264), (356), (436), (535), (727), (932), (1131).
 7. Uveal tract, sympathetic disease, and aqueous humor, (65), (178), (267), (357), (437), (538), (730), (939), (1027), (1135).
 8. Glaucoma and ocular tension, (65), (179), (268), (359), (438), (540), (731), (945), (1028), (1136).
 9. Crystalline lens, (66), (181), (270), (360), (439), (542), (732), (810), (947), (1028), (1137).
 10. Retina and vitreous, (69), (182), (272), (362), (440), (544), (620), (733), (813), (1031), (1139).
 11. Optic nerve and toxic amblyopias, (73), (185), (275), (366), (442), (547), (621), (820), (1037), (1144).
 12. Visual tracts and centers, (76), (186), (276), (366), (443), (624), (822), (1038), (1144).
 13. Eyeball and orbit, (76), (186), (276), (367), (443), (626), (824), (1039), (1144).
 14. Eyelids and lacrimal apparatus, (78), (187), (277), (368), (444), (629), (826), (1040), (1145).
 15. Tumors, (80), (188), (278), (369), (445), (631), (829), (1042).
 16. Injuries, (84), (189), (280), (447), (635), (831), (1043).
 17. Systemic diseases and parasites, (87), (281), (450), (637), (833), (1045).
 18. Hygiene, sociology, education, and history, (88), (282), (451), (640), (835), (1048).
 19. Anatomy and embryology, (90), (284), (454), (643), (838), (1050).
 Accessory nasal sinuses, see Nasal accessory sinuses.
 Accident insurance, eye injuries and, (90).
 and see Compensation.
 Accommodation, (59), (719).
 amplitude of, in fatigued subject, (1047).
 Accommodation, (*Continued*).
 and convergence, 337.
 effect of miotics on, (719).
 Helmholtz theory, (60).
 lenticular, 245.
 mechanism of, (59).
 mobility of lens during, (350).
 paralysis of, (351).
 relation to unilateral suppression of vision, 135.
 speed of, (453), (920).
 voluntary control of, 153.
 Acetylarsan, toxic amblyopia from, (1038).
 Acetylcholine, effect of, in embolism of retinal artery, (818).
 Acne, rosacea, ocular signs in, (726).
 Adaptation, dark, as a clinical test, (911).
 in diminished oxygen pressure of respiratory air, (351).
 graph for recording, 510.
 test of, (529).
 vitamin-A deficiency and, 617, (817).
 effect of bright light on, (531).
 intensity discrimination and, (533).
 light and Purkinje phenomenon, (1126).
 and photophobia, 55.
 Adaptometer, (913).
 Adenoma, of Moll's gland (630).
 pituitary, 801.
 Adie's disease, pupillotonia and, (367), (437).
 Adrenal-cortex extract in glaucoma, (360).
 Adrenalin, in atropine irritation, 53.
 and coloring of senile lens, (733).
 as mydriatic, (165), (170).
 Akrichin, action of, (621), (622).
 Alcohol amblyopia, see Amblyopia.
 Allergy, and cataract, (810).
 ocular disease due to, (178), 526, 1012.
 ocular reactions to, (354), (637), (726), (1044), (1047), (1131).
 after immunization, 852.
 pollen, treatment, (264).
 Alopecia, etc., with uveitis, (65), (942).
 Amaurosis, fright psychosis, (443), (823).
 Amaurotic family idiocy, (1036), (1142).
 Tay Sachs, (72), (1142).
 Amblyopia, classes for, (451), (454), 802, 992, (1048).
 ex anopsia, 426.
 glaucoma in, 1094.
 posthemorrhagic, (822).
 simulation and aggravation of, (528).
 strabismic, (351).
 treatment of, (60).
 toxic, acetylarsan, (1038).
 alcohol, 1070.
 methyl, (820).
 alcohol-tobacco, (74), (185), (186).
 carbon monoxide, (623).
 from hair dyes, (822).
 plasmocide, (185), (186), (623).
 and see Abstracts, section eleven.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- American Academy of Ophthalmology and Otolaryngology, 1936 meeting, 1021.
 Teachers' Section of, 1118.
 American Medical Association, Section on Ophthalmology, 1936 meeting, 521.
 Ametropia, correction of, (350).
 optical basis of, (924).
 and sex, (174).
 Amyl nitrite, in diseases of the fundus, (821), (915).
 in glaucoma, (180).
 Anatomy and embryology, (90), (284), (454), (643), (838), (1050).
 Anemia, eye conditions in, (546).
 Anesthesia, general, in ophthalmic practice, (1124), (1125).
 local, (529), (1125).
 cocaine, (168).
 novocaine blocking, (170), (530), (917).
 luminal, for ocular operations, (915).
 surface, diocaine, (167).
 Anesthetics, convolvuln, (917).
 diotan, (170).
 evipal (sodium evipan), (170), (1124), (1125).
 "H-K. no. 1," (918).
 larocaine, (169).
 pantocaine, (84), (529).
 tiocain, (530).
 Aneurysm, arteriovenous, (184).
 of internal carotid artery, 1053.
 Angioid streaks in retina with pseudoxanthoma elasticum, (274), (364), (1032).
 Angioma, cerebral, with glaucoma, (360).
 of choroid, (65), (1135).
 of lids, (279).
 of orbit, (831).
 Angiomatosis of retina, (359), (737).
 Angioscopy, retinal, (912).
 Angiometer, (928).
 Aniridia, see Iris.
 Aniseikonia, 162, 292, 686, (910), (922), (1125).
 Anisocoria, (348), 891.
 Anisometropia, (838).
 Anisophoria, (533), (927).
 Ankylostomiasis, ocular lesions in, (451), (1048).
 Anomalies, of eye, congenital, (626), (736), (1040).
 of lacrimal puncta, (278).
 of retina, 424.
 of sclera, (727).
 Anophthalmos, 1015.
 and microphthalmos, 249.
 unilateral, (825).
 with orbitopalpebral cyst, 1101.
 Anterior chamber, angle of, comparative anatomy of, 371, 481, 583.
 in glaucoma, (180), 209, (438), (946).
 structure and function of, (540).
 blood injected into, (65).
 cyst in, (267).
 free, (941).
 epithelialization of, (542), (544).
 eyelash in, (635).
 hemorrhage into, (919).
 Anterior chamber, (*Continued*).
 larva in, removal, (835), (1045).
 luxation of lens into, (949).
 measurement of, (527).
 vitreous bands in, (280).
 Anterior segment, blood vessels of, (168).
 tuberculous lesions of, 518, 668.
 Antivirus therapy in ophthalmology, (350).
 Aphakia and detachment of the retina, (1142).
 Aphasia, hemianopsia with, (76).
 Aqueous humor, ascorbic acid in, (85), (948).
 biologic test (Ninni's) of, (1122).
 circulation of, (178), (539).
 generation of, (539).
 glucose value of, 975.
 glutathione in, (277).
 oxalic acid in, (730).
 protein content of, in choked disc, (623).
 vitamin C in, see ascorbic acid.
 and see Abstracts, section seven.
 Arachnodactyly, lens ectopia in, (66), (440) 705, (732), (943), (947).
 Arachnoiditis, optic chiasm, (276), (626).
 Argidal in ophthalmology, (1129).
 Argocall, (167).
 Argyll Robertson pupil, see Pupil.
 Argyrosis, experimental, (85).
 and see Injuries.
 Ars Probatissima Oculorum of Benvenuto Grasso, (1049).
 Arsenic poisoning, ocular changes from, (450).
 Arsenobenzol therapy, diathermy with, (167).
 Arspenamine, ocular reactions from, (1038).
 Arteriosclerosis, light sense in, (527).
 Arteriovenous communication, retinal, (184).
 Artists, vision of, (642), (837), (838).
 Ascariasis, ocular complications in, (451), (1048).
 Ascorbic acid, blood-aqueous barrier and, (67).
 in lens and aqueous, (66), (67), (85), (948).
 after ultraviolet irradiation, (85).
 and see Vitamin C.
 Asia, Central, acute conjunctivitis in, (435).
 Asphyxia, ocular changes in mechanical, (1123).
 Aspirin, ocular reaction to, (1131).
 Association for Research in Ophthalmology, papers read before, 739, 841, 852, 859, 951, 967, 975, 1060.
 Asthenopia, accommodative, 385, (621).
 angle gamma and astigmatism in, (719).
 color, see Color asthenopia.
 Astigmatism, axis of, (172), 222, (350).
 cross-cylinder determination of, (924).
 after cataract operation, (440).
 with epibulbar tumors, (1042).
 lenticular, (924).
 role of the lens in, (921).
 senile, (925).
 Astigmatometry, subjective, (921).
 Ataxia, cerebellar, early diagnosis from eye findings in? (547).
 Atophanyl for sympathetic ophthalmia, (1136).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Atropine, fever in children after using, 247, 434.
 for optic atrophy, (623).
 for plasmocide amblyopia, (186).
- Autohemotherapy, anterior-chamber injections, (65).
 in glaucoma, (269).
 Schieck's intraocular, (728).
 in trachoma, (60), (60).
- Automobile drivers, minimal required vision of, 339, (641).
- Aviators, vision of, (451).
 test, (528).
- Avitaminosis, see Vitamins.
- Awerbach, Michail Josephovich, (835).
 jubilee volume, 1024.
- Bacillemia, tuberculous, (265), (638).
- Bacillus, colon, panophthalmitis from, (940).
 of Koch, (355).
- Bacterium granulosis, see Trachoma.
- Baltimore City Medical Society, Section of Ophthalmology, 608.
- Bandage, (169).
 lastex, (349).
- Barkan, Adolph, 260.
- Basalioma of lid, (632).
- Basedow's disease, see Thyroid disease.
- Bee-sting poison for trachoma, see Trachoma.
- Belgium, sight-conservation class in, (1048).
- Bengal, glaucoma in, (1137).
 ophthalmology in, (453).
 spring catarrh in, (1129).
- Benzyl cinnamic acid ester in ophthalmology, (167), (168).
- Berlin's edema, (273).
- Biomicroscopy, of anterior-chamber angle, 371, 481, 583.
 of cataracts, (270).
 of conjunctiva, (61).
 of lacrimal-gland duct orifices, (188).
 of lens, (542), (548).
 of ocular recti muscles, (348).
- Bird, pecten in coloboma of optic nerve in, (620).
- Blaskovitz operation, see Lids.
- Blennorrhoea, inclusion, (725), (932).
 and see Ophthalmia.
- Blepharitis, (444).
 sapiranga, (188).
- Blepharochalasis, (631), (1040).
- Blepharoplastic operations, see Lids.
- Blepharoptosis, see Lids.
- Blind, the, in Czechoslovakia, (90).
 children, training senses of, (453).
 schooling of, (283).
 syphilis among, (89).
- Blindness, after cranial trauma, (819).
 causes of, (640).
 in children, (283), (836).
 after vaccination for smallpox, (1039).
 classification of, (282).
 data in Saratov eye clinic, (837).
 color, see Color blindness.
 cortical, (624).
 hereditary, (527).
- Blindness, (*Continued*).
 after meningococcal operation, 1017.
 in Palestine, (90).
 prenatal and congenital infections in relation to, (837).
 prevention of, (640).
 International Society for, 738.
 National Society for, statistics, (836).
- Blind spot, subjective studies of, 34, (348).
 changes in size of, (166).
- Blinking, (827).
- Blood, diseases of, and ophthalmic complications, (545), (546), (815).
 lipids in lipemia retinalis, (546), 645.
 physico-chemical constants of, in glaucoma, (269).
 staining of cornea, 707.
 transfusion, in ophthalmology, (834).
 for sympathetic ophthalmia, (730).
- Blood-aqueous barrier, (167), (731), (824).
 and vitamin C, (67), (941).
- Blood pressure, in capillaries of macular region, (620).
 general, and in central retinal artery, (441).
 effect of hot and cold ocular applications on, (349).
 low, effect of, upon optic-nerve disease, (1037).
 relation of, to intraocular tension, (74).
- Bone formation, in eye, (77).
 in the orbit, (277).
- Bone fragility and blue sclerotics, (64), (935).
- Book, the talking, (837).
- Books
 Awerbach jubilee volume, 1024.
 Berens, Conrad. The eye and its diseases, 1022.
 Boström, C. G. Plates for testing color vision, 434.
 Bulletin et Mémoires de la Société Française d'Ophtalmologie, 1935, 433.
 Cantonnet and Filliozat. Strabismus, 524.
 Gifford, S. R. An outline of ophthalmology, 57.
 Giza Memorial Ophthalmic Laboratory, 1934 report, 344.
 Hansel, French K. Allergy of the nose and paranasal sinuses, 526.
 Hartmann, Edward. La radiographie en ophtalmologie. Atlas clinique, 809.
 Marquez, Manuel. Lecciones de oftalmologia clinica especial, 1024.
 Marshall, J. Cole. Detachment of the retina. Operative technique in treatment, 618.
 Ochsner, Edward H. Social security, 344.
 Pacific Coast Oto-Ophthalmological Society, 1935 transactions, 163.
 Peter, Luther C. The extraocular muscles, 908.
 Pugh, M. A. Squint training, 714.
 Rabkin, E. B. Polychromatic plates for color-sense examination, 1120.
 Rolf, D. E. Outline of ophthalmology, 259.
 Tadhkirat of Ali ibn Isa of Baghdad, 618.
 Terrien, F., Veil, P., and Dollfus, M.-A.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

Books, (Continued).

- Detachment of the retina and its treatment, 1119.
- Travers, T. & B. Concomitant strabismus, 258.
- Botulism, ocular involvement in, (282).
- Bowman's membrane, colloidal, chemical significance of, (357).
- Brain, glycosides of occipital lobes, (626).
- lesions, pupillary reactions in combined, (625).
- relation of eye to, (1142).
- syphilitic processes at base of, (77).
- temporal lobe, visual-field defects in, (624).
- tuberous sclerosis, fundus changes in, (446).
- tumors, diagnosis, (275).
- exophthalmos from, (367).
- homonymous hemianopia from, (625), (823).
- left parietal lobe, (624), (625).
- neuroblastoma, ocular symptoms from, (446).
- supratentorial, field defects from, (186).
- disturbance of color perception from, (351).
- and see Hypophysis.
- "Brille" in rattlesnake, (838).
- Brooklyn Eye and Ear Hospital, (452).
- Brussels, eye hospitals of, (451).
- Bucky rays in eye disease, (917).
- Buphthalmos, and blue sclerotics, (1134).
- with nevus flammeus, (180).
- Burns, ocular, see Injuries.
- Byzdoszcz, blind asylum, (454).
- Cajal, a medical philosopher, 904.
- Calcutta, keratoconjunctivitis in, 982.
- Callahan tubes for dacryocystitis, 601.
- Canaan, land of, see Palestine.
- Canthotomy, hemostatic clamp for, (1124).
- Canthus, plastic surgery of, 1115.
- Carbaminoylcholin (Doryl), (269), (438), (916).
- Carbon dioxide, effect of, on nystagmus, (533).
- on pupil movements, (437).
- lack of, and visual intensity discrimination, (1126).
- Carbon-monoxide poisoning, effect on eye, (623).
- Carcinoma, in cattle, hereditary, (447).
- of choroid, metastatic, (82), (280), (634), (829), (829).
- fundus pictures in, (446).
- of ciliary body, metastatic, (189).
- of eye, (188).
- of iris, metastatic, (82).
- of lacrimal sac, (84).
- of optic nerve, (188), (280).
- uveal, (369).
- Cardiovascular disease, retinal angioscopy in, (1140), (1141).
- Carotin, in corneal transplanting, (537).
- effect of, in external eye disease, (435).
- in ophthalmology, (168).
- Case histories, photography of eye for, 241.
- Cataract, (543).
- after, (812).
- focal lamp for removal of, (812).
- allergy and, (810).
- biomicroscopy of, (69), (270).
- brunescens, (1138).
- capsular, 51.
- chemistry of, (543).
- in the diabetic, (732).
- phospholipid content, (271).
- congenital, hereditary, (733).
- nuclear, 426.
- posterior needling in, (1137).
- diabetic, 158.
- dinitrophenol, 320, 332, 431, 512, 515, (542), (542), (543), 798, 885, 900, (1137), (1139).
- dystrophia myotonica with, 899.
- electric, (85), (1043), (1043), (1043).
- endocrine, (270), (1028).
- experimental, (361), (362), (1031).
- extraction, (543), (543), (1029).
- best time for, (732).
- of choroidal cataract, (270).
- comparison of methods, 154, (1028).
- complications in and after, 52, 146, 250, (542), (733), 1006, (1139).
- astigmatism, (440).
- deformation and decentration of pupil, (271).
- delayed healing, (733).
- detachment of choroid, (182), (812).
- epithelialization of anterior chamber, (542), (543).
- hernia of iris, (68).
- herpes iridis, etc., (1046).
- histopathology of, (641).
- infection, 328.
- iridocyclitis, 898.
- prevention of, (543).
- retinal detachment, 519.
- swollen lens remains, (810).
- consecutive, of lens and capsule, 1116.
- corneal suture, (270).
- in the country, (812).
- extracapsular, (1030), (1138).
- instruments for, forceps, capsule, 749, (811).
- iris, (811).
- lens, (68).
- speculum, (68).
- intracapsular, (69), (361), (439), (542), (812), (947), 1006, (1029), (1030).
- diathermy in, 1105.
- crisiphake for, (1029).
- Knapp, (66), 154, (1138).
- Lacarrère, (543).
- Verhoeff, (181), (542), (811).
- late results of, (811).
- repair of sclerocorneal incision in, (271).
- of senile cataract, (811), (1029).
- sutures, for lid control, (439).
- special clamp to hold, (1122).
- conjunctival, (811).
- parallel corneoscleral, (733).
- of traumatic cataract, (85), (1029).
- utility of ultraviolet lamp in, 770, (949).
- familial occurrence, lamellar, (813), (1137).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Cataract, (*Continued*).
 heat, (811), (1029), (1138).
 hereditary, (426), (439), (544), (723).
 incidence of, in South India, (1139).
 juvenile, calcareous, 335.
 hereditary, (439).
 parathyroid in, (812).
 posterior needling in, (1137).
 light energy, (810).
 mature, (1029).
 morgagnian, 799.
 with neurodermatitis, morphology, (810).
 nigra, with cornea plana, 307.
 and optic atrophy, 251.
 punctate, (182).
 senile, (543), (1138).
 clinical forms of, (811).
 effect of lens antigen on, (68).
 etiology of, (68).
 glutathione in the blood in, (360).
 glycemia and glycohydia in, (181).
 keratoconus with, (1132).
 posterior subcapsular, (67).
 relation of radiation to, (1029).
 vitamin C in blood and urine, (542).
 slitlamp findings in, (543).
 and spasmophilia, (68).
 subcapsular, (67), (271), (732).
 tetanic, morphology, (361).
 traumatic, 335.
 experimental, (181).
 rosette, (182), (1045).
 treatment, in history, (1138).
 medical, (66).
 gravidan, (732).
 xeroderma pigmentosum and, (1030).
 X-ray, (85), 739.
 zonular, (724), (1030).
 optical iridectomy in, (1030).
 and see Lens.
- Cattle, hereditary ocular carcinoma in, (447).
- Cavernous sinus, see Nasal accessory sinuses.
- Cephalalgia, see Headache.
- Cerebrospinal fluid, meninges and, (626).
- Cerebrospinal meningitis, ocular complications of, (638).
- Certification, purpose of, 907.
- Cervical sympathectomy, for retinal pigmentary degeneration, (185), (366), (545), (737).
- Chalazion, pathogenesis of, (369).
 treatment, (444).
- Charlin's nasociliary syndrome, see Syndrome.
- Chauffeurs, minimal vision for, 339, (641).
- Chaulmoogra oil for trachoma, (355).
- Chemistry of retina, 535.
- Chiasm, (367).
 and see Hypophysis.
- Chicago Ophthalmological Society, 155, 337, 517, 611, 1014.
- Children, apparent increase of hyperopia in, 1106.
 blind, (453).
 causes of blindness in, (283), (836).
- Children, (*Continued*).
 corneal lacerations in, 703.
 correction of vision of, (533).
 dacryocystitis in newborn, (79).
 ocular injuries in, (635).
 orbital complications of sinusitis in, (824).
 paresis of accommodation in, (351).
 refraction of, 422.
 retinal fibrosis in, 576, (818).
 school, follicular conjunctivitis of, (723).
 vision of, (720).
 defective, in Texas, (641).
- Chinese, incidence of myopia among, (923).
- Chloroma of orbit, (81).
- Chlorosis, ocular complications of, (366).
- Cholesterin in lacrimal sac, (80).
- Chondroplasty in trachomatous pannus, (176).
- Choroid, angioma of, (65).
 cavernous, (1135).
 coloboma of, (268), 900.
 detachment of, after cataract extraction, (182).
 hyaline excrescences of lamina vitrea of, (941).
 pigment in latent holes of, (183).
 tuberculosis of, (358), 798, (1027).
 tumors of, see Tumors.
- Choroiditis, anterior, 798.
 disseminated, 613.
 tuberculous, (438).
 and see Retinochoroiditis.
- Chronaxia in disease of optic nerve and retina, (75).
- Chuvash republic, trachoma study of, (284).
- Cilia, see Eyelash.
- Ciliary body, angioneurosis of, (267), (360).
 culture of, (451).
 indications for cyclectomy, (635).
 nerve supply of, (284).
 Sanarelli-Schwartzmann phenomenon in, (348).
 surgery of, 616.
 tumors, see Tumors.
- Cinematography, fusion training with, (922).
- Clamp, hemostatic, for canthotomy, (1124).
 for holding lid sutures, (1122).
- Clinics, eye, (283).
 Florence, trachoma campaign in, (452).
 Jassy, keratoconjunctivitis in, (62).
 Kaunas, retinal detachment in, (813).
 Kuban, (821).
 Paris and Brussels, (451).
 Saratov, causes of blindness, (837).
 Vienna, (1049).
 Warsaw University, (187).
- Clostridium welchii, (825).
- Coats's exudative retinitis, see Retinitis.
- Cocaine anesthesia, insufficiency, (168).
 and hydrogen-ion concentration, (349).
- Cod-liver oil for external eye disease, (919).
- Coley's mixed toxins, (169).
- College of Physicians of Philadelphia, Section on Ophthalmology, 47, 48, 153, 512, 707, 801, 901, 1109.
- College of Surgeons, The International, 1025.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Colloids, reabsorption of, (178).
 Coloboma, of choroid, (268).
 of lens and retina, 900.
 of lens, (362).
 of lid, (78).
 plastic repair of, (444), (1040).
 of macula, (268), (545).
 in twins, (815).
 of optic nerve and retina, pecten in, (620).
 Color asthenopia, (720).
 and decreased blood oxygen, (925).
 Color blindness, 704, (1126).
 daltonism, (922).
 hereditary, (921).
 neophan glass in, (925).
 in railroad engineers, (641).
 tests of, in machinists, (532).
 and traffic signals, (925).
 and see Perception.
 Color distinction, see Perception.
 Color fields, see Visual fields.
 Color perception, see Perception.
 and see Vision.
 Colorado Ophthalmological Society, 50, 426, 606, 798, 897, 899, 1017.
 Compensation for ocular injuries, (89), (90), (836).
 Congo red, (264).
 Conjunctiva, (60), (175), (263), (354), (435), (534), (723), (929), (1128).
 argyrophile fibers in, (932).
 argyrosis of, (85), (263), 802.
 biomicroscopy of, (61).
 cul-de-sac, hypertrophied mucosa of, (929).
 cysticercus in, (450).
 depression of, spontaneous, (728).
 epithelium of, structure, (91).
 examination of, (726).
 experimental infection of, after dichlor-ethylsulphide, (929).
 follicular hyperplasia of, (932).
 granuloma telangiectoides of tarsal, (930).
 hypertrophy of, (932).
 papillomatous, (932).
 leishmaniasis of, (1145).
 lesions of, staphylococcus pyogenes in, (263).
 lupus erythematosus of, 802.
 lymphangiectasia hemorrhagica of, with cataract, (724).
 lymphoma of, (929), (1128).
 pathologic anatomy of, in trachoma, (929).
 pemphigus of, (62), (356).
 Sanarelli-Schwartzmann phenomenon in, (348).
 in trachoma, (1130).
 tuberculosis of, (62), (929), (1130).
 exanthematous, (355).
 primary, (723), (931).
 tumors of, see Tumors.
 xerosis of, 427.
 Conjunctival flap for trephining operations, 46.
 Conjunctival sac, absorption of drugs from, (349).
 asepsis of, in intraocular operations, (1125).
 Conjunctival sac, (*Continued*).
 plastic surgery of, (916), (1039).
 stretching of, for prothesis, (443).
 Conjunctivitis, (931).
 acute, in Central Asia, (435).
 eruptive fever with, (281).
 from Micrococcus catarrhalis, (175), (724).
 allergic, (354), (436), (726), (1131).
 artificial, (354).
 bacterioscopy of, (726).
 carotin for, (435).
 colloidal zinc for, (175).
 diphtheric, (1129).
 endogenous, (355).
 with eruptive fever, (281).
 fibrous, (723).
 follicular, of children, (723).
 in dogs, (930).
 X-ray treatment of, (1130).
 gonorrheal, see Ophthalmia.
 inclusion-body, see Blennorrhoea.
 of measles, trachoma after, (727).
 membranous, artificial, (726).
 persistent, after enucleation, 897.
 meningococcus, 780.
 Papino's, (534).
 in papular fever, (1046).
 Parinaud's, diagnosis of, (1130).
 etiology, (62).
 histopathology, 571.
 following spinal meningitis, 606.
 swimming-pool, (436).
 trachoma and, (930).
 vernal, (932), (1129).
 in Bengal, (1129).
 effect of vitamin C on, (534).
 epibulbar neurofibroma or, 899.
 vagosympathetic imbalance in, (62).
 from verruca of lid, (1131).
 vocational, in porters, (283).
 Connective-tissue (reticular) staining, (1123).
 Contact glasses, see Spectacle lenses.
 Contusions, see Injuries.
 Convergence, and accommodation, 337.
 and determination of distance, (353).
 insufficiency, (354), (1128).
 Convolvul, (917).
 Copper intoxication, behavior of eye in, (639).
 Corbus-Ferry gonococcus filtrate, (535).
 Corelysis, see Iridodialysis.
 Cornea and sclera, (62), (176), (264), (356), (436), (535), (727), (932), (1131).
 Cornea, abscess, (536), (177).
 allergic affections of, (726).
 arcus lipoides of, (1133).
 blood staining of, 707, (938).
 blood vessels of, (1050).
 casts of, method for making, 593.
 conduction of heat through, (932).
 conical, see Keratoconus.
 culture of preserved tissue, (933).
 cyst, in glaucoma, (181).
 degeneration, calcareous, (939).
 familial, (727).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Cornea,
 degeneration,
 familial, (*Continued*).
 hereditary, keratoplasty for, (1132).
 nodular, (356).
 fatty, (939).
 interstitial, 413.
 marginal, (64), (178).
 oil-globule, (64).
 diffusion phenomena of, (168).
 dystrophy, 1111.
 endothelial, (935).
 Fuchs's epithelial, 425.
 lattice type (178), 866.
 marginal, (357).
 nodular, (177), 607.
 total, keratoplasty for, (1132).
 ectasia, bilateral, (1135).
 furrow keratitis with, (728).
 epithelium, uric-acid crystals in, (934).
 in experimental diabetes, (64).
 in experimental xerophthalmia, (933).
 familial superficial alteration of, (266).
 fetal, for keratoplasty, (63).
 glutathione content of, (277).
 grafts, see transplantation.
 guttata, (935).
 herpes of, (178), (265), (536), (729).
 traumatic, (729).
 injuries, see Injuries.
 innervation of, (91).
 Kayser-Fleischer ring of, 26.
 keratitis, see Keratitis.
 keratoconus, see Keratoconus.
 keratoplasty, see Keratoplasty.
 lupus erythematoses of, (264).
 megalocornea, see Megalocornea.
 opacity, measurement of, (537).
 in microphthalmos, (1144).
 palm-leaf, (63).
 punctate, (537).
 quinine therapy of, (530).
 from sugar of lead, (1134).
 pannus, Denig's transplant for, (537).
 inactive, diagnostic value of, (730).
 and see Trachoma.
 pathologic, fine-hair method of studying, (938).
 permeability of, (168).
 phlyctenular disease of, (531), (726), (1129).
 pigmentation, (939).
 Krukenberg's spindle, (64), (935).
 pitting of, (176).
 plana, familial, 307.
 precorneal layer of fluid, (828).
 protection of, in tonometry, (910).
 reaction of, to tuberculin tests, (1133).
 reticulo-endothelial system and, (265), (926).
 Sanarelli-Schwartzmann phenomenon in, (348).
 sensibility of, in trachoma, (537).
 staphyloma of, (934).
 tattooing of, 251, (934), (935).
 thickness of, effect on total ocular refraction, (721).
 trachomatous, see Trachoma.
- Cornea, (*Continued*).
 transplantation, (436), 805, (936), (937), (937).
 cadaveric, (728).
 carotin in, (537).
 hermetic and Hippel trephines for, (938).
 partial, (437), (728), (729).
 histology of, (536).
 technique, (728).
 total, (934).
 trephines for, (728), (938), (1132).
 and see Keratoplasty.
 tuberculosis of, (537).
 primary, (933).
 tumors of, see Tumors.
 ulcers of, 703.
 from allergen, (178).
 from fungus *Glenospora graphii*, (1135).
 gonorrheal, sympathetic ophthalmia from, (1027).
 Mooren's, 613.
 from papular fever, (1046).
 serpiginous, (171), (265), (727).
 etiology, (266).
 treatment, (436), (729).
 treatment, (177), (730).
 contact glass, 888.
 extract of lacrimal gland, (62).
 massage, (531).
 silver, (535), (729).
 varicella of, (357).
 vascularization of, in diabetes, (638).
 white ring of, (536), (537), (537), (935), (1134).
 and see Keratitis.
- Corneal plate, structure of, (284).
 Correspondence, 58, 164, 345, 434, 715, 1025, 1121.
 Cortin in glaucoma, (1028).
 Cranial deformities, ocular lesions with, (822).
 Cranial trauma, see Injuries.
 Cross cylinder, see Refraction.
 Crouzon's disease, embryology of, (622).
 Crystalline lens, (66), (181), (270), (360), (439), (542), (732), (810), (947), (1028), (1137).
 and see Lens.
 Cyclectomy, (635).
 Cyclitic membrane, 897.
 Cyclodialysis, see Glaucoma.
 Cyclitis, postoperative, (730).
 Cyclopia, (643).
 in kitten, (825).
 Cylotropin for sympathetic ophthalmia, (1136).
 Cyst, in anterior chamber, (267).
 free, (941).
 corneal, in glaucoma, (181).
 dermoid, (627).
 echinococcic, see *Cysticercus*.
 of iris, congenital, 287.
 epithelial, (267), (538).
 spontaneous, (267).
 traumatic, (178), 512.
 meibomian, (630).
 of orbit, hematic, (368).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Cyst,
 of orbit, (*Continued*).
 hemorrhagic, (826).
 hydatid, (281).
 orbitopalpebral, anophthalmos with, 1101.
 in retina, 513, (631), (813).
 and detachment, (70), (441).
 exudative retinitis and, (813).
- Cysticercosis, (88).
- Cysticercus, conjunctival, (450).
 hydatid, (281).
 intraocular, (88).
 retrobulbar, (1045).
 of vitreous, (734).
- Cystin, effect of deprivation of, on lens,
 (270), (1029).
- Cystoid degeneration causing rupture of ora
 serrata, (442).
- Czechoslovakia, blindness in, (90).
 treatment of glaucoma in, (947).
- Dacryocanaliculitis, mycotic, (1145).
- Dacryocystitis, Callahan tubes for, 601.
 from malformations, (826).
 following maxillary sinusitis, (1041).
 of newborn, (79).
 in Warsaw clinic, (187).
- Dacryocystorhinostomy, (277), (629), (826),
 (827), (827), (828), (828).
- Dacryops, (1040).
- Dacryostenosis, (1040).
 permanent spiral cannula for, (629).
- Dark adaptation, see Adaptation.
- Darkroom for scientific meetings, 894.
- Deaths (see also Obituaries).
 Baker, H. B., 950.
 Bell, Thomas Herbert, 192.
 Berry, John Cutting, 548.
 Brown, Marion Earle, 1051.
 Capion, Franklin Pierce, 285.
 Chandler, Henry Beckles, 1146.
 Cohen, William, 92.
 Farmer, H. Hershey, 644.
 Frost, W. Adams, 192.
 Graves, Philip Abernethy, 1051.
 Holloway, T. B., 950.
 Howard C. Norman, 285.
 Hull, James Meriweather, 738.
 Hurley, Edward Daniel, 950.
 Jennings, J. E., 92.
 Kiefer, Hugo Albert, 192.
 King, Clarence, 1051.
 King, James Joseph, 192.
 Kjos, Clarence Eugene, 644.
 Lebensohn, M. H., 950.
 Leech, James William, 1146.
 Look, Henry Harve, 644.
 McBride, William Otis, 285.
 McConnell, Thomas Ethelbert, 548.
 Macleish, Archibald Campbell, 644.
 Neman, R. H., 92.
 North, Emmett P., 192.
 Phillips, Thomas Charles, 455.
 Prendergast, David Aloysius, 285.
 Proctor, Francis I., 738.
 Radcliffe, McCluney, 548.
 Robinson, George Willis, 950.
 Roller, Louis Alfred, 644.
- Deaths, (*Continued*).
 Rust, Edwin G., 455.
 Sharrett, George Oliver, 1146.
 Shute, Daniel Kerfoot, 92.
 Smith, Stanley Sinclair, 285.
 Souter, W. N., 192.
 Steese, Edwin S., 369.
 Thomson, John Joseph, 369.
 Tomlin, William S., 455.
 Tyson, Henry Hawkins, 738.
 Wilbrand, Hermann, 194.
 Wilmer, William H., 369.
 Wormley, Harry Ralph, 285.
- Denig's, advancement operation, (721).
 transplant, (63), (187), (537).
- Dental infection, see Focal infections.
- Depth perception, see Perception.
- Descemet's membrane, colloidal chemical
 significance of, (357).
 rupture of, (181).
- Desmarres lid elevator in treatment of tra-
 choma, (725).
- Deutschmann, Richard, (452).
- Diabetes, cataract, 156.
 with dwarfism, (271).
 changes in refraction in, (350).
 experimental, effect on canine cornea, (64).
 juvenile, retinal hemorrhages in, 50.
 ocular complications of, 424, (545), (1143).
 lipemia retinalis in, (546).
 rubeosis iridis with, (538), (638).
- Diagnosis, general methods of, (165), (347),
 (527), (717), (910), (1122).
 general, ophthalmoscopy of, 432.
- Diathermy, (170).
 diaphanoscopy with, (185).
 medical, effect on ocular tension, (66).
 in ocular lues, (167).
 surgical, in cataract extraction, 1105.
 extirpation of lacrimal sac with, 699.
 in iris prolapse, (1044).
 and see Retinal detachment.
- Diathesis, hemorrhagic, (735).
- Dicoria in antiquity, (452).
- Diktyoma, (831).
- Diphtheria toxin, effect on ocular-tissue cul-
 ture, (451).
- Dinitrophenol, cataract, 320, 332, 431, 512,
 515, (542), (542), (543), 798, 835, 900,
 (1137), (1139).
 chemistry, etc., of, 515.
- Diocaine, (167).
- Diotan, (170).
- Diplopia, diagnosis of, (722), (929).
 plotting of, 698.
- Diploscope in determining heterophoria,
 (174).
- Distichiasis, congenital, (187).
- District of Columbia sight-conservation
 classes, 802.
- Doryl in glaucoma, (269), (438), (916).
- Dropsy, glaucoma, etc., from, (541), (1136),
 (1137).
- Drugs, absorption of, from conjunctival sac,
 (349).
- Drusen, (74), (1037).
- "Dürer look," (642).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Dwarfism, cataract with, (271).
 Dysenteries, bacillary, ocular complications of, (1048).
 Dyslipidoses, ophthalmology and, (1036).
 Dystrophy, bony, ocular lesions in, (822).
 of cornea, see Cornea.
 myotonica, with cataract, (899).
 Eclampsia, retinal detachment with, 610.
 Ectropion, see Lids.
 Editorials
 Adaptation and photophobia, 55.
 A.M.A. in Kansas City, The, 521.
 Ciliary-body surgery, 616.
 Consecutive extraction of lens and capsule, 1116.
 Contemporary critics of Graefe, 159.
 Corneal transplantation, 805.
 Dinitrophenol cataract, 431.
 Evaluation of clinical and laboratory findings, 162.
 Eye in sculpture, The, 520.
 Free-circulation medical-abstract journals, 712.
 Licensing of opticians, 343.
 Midwinter course and Western Ophthalmological Society, 342.
 Nerve strains of vision, 1018.
 New York meeting of the American Academy of Ophthalmology and Otolaryngology, The, 1021.
 Ophthalmoscopy in general diagnosis, 432.
 Optimum light, 807.
 Papilledema with extracranial disease, 907.
 Purpose of certification, The, 907.
 Refraction in Europe and America, 54.
 Reticulo-endothelial system, The, 1019.
 Retinal lesions and general prognosis, 254.
 Screen parallax for orthoptic training, The, 1117.
 Short courses for specialists, 808.
 St. Louis meeting of the Southern Medical Association, 56.
 Spanish medical philosopher, A, 904.
 Statistics on ocular neoplasms, 257.
 Sympathetic ophthalmia after filtration operations, 430.
 Teachers' Section of the Academy, The, 1118.
 Thrombosis of the cavernous sinus, 256.
 Throw away your glasses, 710.
 Trachoma, 161.
 Vitamin-A deficiency, 617.
 Which first, tear or detachment? 340.
 Egypt, Giza Memorial Ophthalmic Laboratory, 1934 report, 344.
 leishmaniasis of lids and conjunctiva in, (1145).
 ocular complications of endemic diseases in, (451).
 Ehrlich-Türk line, (267).
 Electric injuries, see Injuries.
 Elliot trephining, see Glaucoma.
 Embedding in nitrocellulose, 153, (165).
 Encephalitis, epidemic, eye changes after, (186).
 Encephalitis, (*Continued*).
 lethargic, ophthalmoplegia after, (1127).
 Endemic diseases, effect of, on eye, (1048).
 Endocrines, eye and, (639), (835), (1028), (1046), (1143).
 Endophthalmitis, septic, retinal periphlebitis with, (816).
 after spinal meningitis, 606.
 Endothelioma, conjunctival, (82).
 of optic nerve, (83), (634).
 Enophthalmometer, (1123).
 Enophthalmos, etiology, (627).
 traumatic, (367).
 Entropion, see Lids.
 Ependymoma, of retina, (632).
 Ephedrine as mydriatic, (165).
 Epiphora, alcohol injections for, (445).
 emotional factor in causation of, (1046).
 silver nitrate for, (80).
 dangers of, (80).
 Episcleritis, see Sclera.
 Epithelioma, of canthus, (829).
 of conjunctiva, (1043).
 of cornea, (81).
 epibulbar, (1043).
 of lid, (81).
 of limbus, (81), (1042).
 of sclerocorneal junction, (278).
 Erisiphake, new model, (1029).
 Errata, 346, 716.
 Erythema nodosum, episcleritis and, (1132).
 Esophoria, high, 503.
 Esotropia and right hyperphoria, 803.
 Estaban's vaccine in trachoma, (175).
 Evaluation of clinical and laboratory findings, 162.
 Evipal, (170), (1124), (1125).
 Exophoria, myopia and, (173).
 Exophthalmometer, (1123).
 Exophthalmos, experimental, (186), 1112.
 of hyperthyroid origin, (826).
 etiology of ocular symptoms, (443).
 or retrobulbar tumor, 900.
 inflammatory, sinus disorders and, (824).
 intermittent, (78), (627), (825).
 monocular, from brain tumor, (367).
 of nasal origin, (627).
 from orbital tumor, (77), (279).
 in osseous xanthomatosis, (627).
 progressive, after thyroidectomy, 428.
 pulsating, (78), (78).
 in infancy, (1040).
 surgical aspects of, (443).
 from sphenoidal tumor, (367), (824).
 Exotropia, strong concave lenses for, 1106.
 Eye, angiosclerotic lesions of, (87).
 anomalies of, (626).
 inherited, (1040).
 artificial, see Prosthesis.
 axes of, relation, 967.
 beliefs and superstitions concerning, (1048).
 biochemistry of, (825).
 and see under names of individual structures.
 center of rotation of, (919).
 Cephalosporium in, (638).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

Eye, (*Continued*).

chronaxia and diseases of, (75).
 circulatory apparatus of, (541).
 and vitamin C, (940).
 comparative morphology and embryology of, (643).
 copper intoxication and, (639).
 cyclopean, (91).
 and its diseases, 1022.
 disease, allergic, (637).
 benzyl cinnamic ester in, (167).
 electrolytic threshold in, (913).
 emotional factor in, (1046).
 endocrine, (639), (835).
 experimental iritis from bacterial cultures from, 1060.
 external, allergic tests in, 1012.
 Bucky rays for, (917).
 cod-liver oil for, (919).
 gravidan therapy in, (167).
 hereditary, (1049).
 osmotherapy for, (915), (916), (940).
 in Palestine, (90).
 physicodietetic treatment of, (530).
 scrofulous, and tuberculous, (834).
 spring and, (834).
 tebeprotein therapy in, (916).
 tuberculous, pulmonary conditions in, (1047).
 vascular system and, (88).
 vitamin A in, (629), (1124).
 X-ray therapy for, (169).
 disturbances of, functional, (910).
 effect of, carbon-monoxide poisoning on, (623).
 endemic disease on, (1048).
 hydrochloride of methyloctenylamin on, (165).
 posterior-lobe extract on, (1125).
 prolonged hunger on, (638).
 radiant energy on, (169).
 ultrashort waves on, (349).
 X rays and radium on, (1124).
 electrical response of, to light, (352).
 after epidemic encephalitis, (186).
 fetal, sclerotic protuberance in, (1050).
 fluids of, nature of, 859.
 form of, in sculpture, 520, (640).
 formation of lymph follicles in, (445).
 inability to close, (171).
 infection, experimental, (929).
 inflammations, recurring, (1046).
 injuries, see *Injuries*.
 microanatomy of, 371, 481, 538.
 opening and closing of, (827).
 penetration of drugs into, (530).
 points of attack in, (452).
 pregnancy and, (834).
 protection of, in mountain climbing, (191).
 relation of brain and, (1142).
 reticulo-endothelial system of, (87), (264), (265), (347), (936), 1019, (1131).
 schematic, (527).
 transillumination of, (528).
 tuberculosis and, (834).
 Eyeball and orbit, (76), (186), (276), (367), (443), (626), (824), (1039), (1144).

Eyeball, atrophy of, bone formation in, (77).
 Vicherkevich's operation in, (940).
 adiposis of, after endobulbar inflammation, (626).
 displacement of, from echinococcus cyst, (1045).
 luxation of, voluntary, 316.
 measurements of, (643).
 position and size of, and cranial development, (643).
 retraction of, (627).
 Eyegrounds, see *Fundus*.
 Eye hospitals
 Brooklyn Eye and Ear, (452).
 Brussels, (451).
 Herman Knapp Memorial, (453).
 in London, defunct, (454).
 Manhattan Eye, Ear, and Throat, (454).
 Mohan, Aligarh, (1138).
 Nacional de Clinicas, (1138).
 New York Eye and Ear Infirmary, (454).
 Royal London Ophthalmic, (642).
 Eyelashes, in anterior chamber, (635), (637).
 distichiasis, congenital, (187).
 ocular lesions from dyeing, 894.
 poliosis of, (630).
 in tarsus of upper lid, (631).
 Eyelids and lacrimal apparatus, (78), (187), (277), (368), (444), (629), (826), (1040), (1145).
 Eyelids, see *Lids*.
 Eye clinics, see *Clinics*.
 Facial diplegia, ocular involvement in, (1041).
 Fatigue, ocular, functional test to study, (721).
 measure of, (531), (531).
 speed of, (920).
 ocular reaction to, (1047).
 Fear, the reaction of, 1009.
 Fetus, eye of, (1050).
 Fever, eruptive, with ophthalmia, (28).
 papular, eye complications of, (1046).
 therapy, (275).
 for ocular syphilis, (915).
 Fibroblastoma, meningeal, (624).
 Fibrosis, retinal, in children, 576, (818).
 Fields, see *Visual fields*.
 Filaria, encapsulated, in upper lid, (1045).
 subconjunctivalis, (281), (638), (1048).
 Filatov-Marzinkowsky trephines, see *Trephine*.
 Flavin, in lens, (361).
 Flicker, phenomenon, (913).
 Florence, antitrachoma campaign in, (452).
 Fluorescein, action of, on metabolism of pneumococcus, (1124).
 Focal infection, and diseases of the eye, (187), (282).
 teeth, (282), (639), (943).
 and see *Nasal accessory sinuses*.
 Forceps, capsule, 794, (811).
 Hess iris, (811).
 for ocular-muscle surgery, (353).
 for removing shot from vitreous, (637), (833).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Foreign bodies, see Injuries.
 Fovea, mechanism of, (1125).
 Frames, see Spectacle lenses.
 French Ophthalmological Society, bulletin, 433.
 Fright psychosis, (443).
 Fuchs's, black spot in myopia, (718), (922).
 epithelial dystrophy, 425.
 heterochromia, (730).
 Fundus, angioid streaks of, see Angioid streaks.
 changes, in arteriosclerosis and hypertension, (362), (1032).
 in lymphogranulomatosis, (1035).
 myopic, in nonmyopic eye, (531).
 in Niemann-Pick's lipoidosis, (72).
 in tuberous sclerosis of brain, (446).
 color of, (818), (912).
 disease of, amyl nitrite therapy of, (915).
 pigment and visual fields in, (912).
 green patches in, (347), (348), (911).
 photography of, (717).
 stereoscopic, (347), (910).
 self-examination of, (349).
 slitlamp examination of, (718).
 shining white spots in, (274).
 in tuberous sclerosis, 508.
 Fungus, Cephalosporium, (638).
 in dacryocanalculitis, (1145).
 Glenospora graphii, (1135).
 Sporotrichum councilmani, (630).
 Streptothrix försteri, 418.
 Fusion, binocular, and rivalry, (920).
 training, moving picture, (922).
 Gallemaerts, Emile, (641).
 Gangrene, ocular involvement, (186).
 Gases, war, (832).
 Guaiacol cacodylate in keratoconjunctivitis, (1129).
 Gelatin light filters, (165).
 General diseases, see Systemic diseases.
 Gillies's conjunctivoplasty, (916), (1039).
 Giza Memorial Ophthalmic Laboratory, 1934 report, 344.
 Glasgow, Bacterium granulosus in trachoma in, (725).
 Glasses, see Spectacle lenses.
 Glaucoma and ocular tension, (65), (179), (268), (359), (438), (540), (731), (945), (1028), (1136).
 Glaucoma, (732).
 acute, 43.
 dosage of pilocarpine in, (946).
 from morgagnian cataract, 799.
 allergic, (360).
 in amblyopia, 1094.
 angioma with, facial and cerebral, (360).
 anterior-chamber angle in, (180).
 in Bengal, (1137).
 capsular, (946).
 chronic, primary, etiology, (946), (1137).
 simple, keratoconus with, (1132).
 closure of vessels in, (731).
 consensual ophthalmotonic reactions in, (1028).
 with cornea plana, 307.
 Glaucoma, (*Continued*).
 cortin in, (1028).
 diagnosis of, early, (541).
 pigment epithelium in, (438).
 edema of cornea in, (181).
 emotional factor in causation of, (1046).
 epidemic dropsy, (541), (1136), (1137).
 genesis of, 209, (438).
 glaucomatous cupping without, (180).
 hemato-ocular barrier, permeability of, (731).
 hemorrhagic, X-ray therapy, (731).
 heterochromic, (360).
 and hypacusia, (87).
 without hypertension, 612.
 iris atrophy with, 156.
 medical aspects of, (541).
 metabolism in, (947).
 and nevus flammeus, (359), (540).
 operations, cyclodialysis, 21, 164, (731).
 anatomic changes after, (946).
 Heine's, results of, (269).
 results of, (945).
 goniotomy, 951.
 ionization with glaucosan, (540).
 iridocorneosclerectomy, 470.
 iridectomy, histopathology after, (641).
 sclerecto-, enlargement of nasal field after, (946).
 Zirm's, (180).
 iridencleisis, results of, in glaucoma simplex, (360).
 sclerectomy with, (732).
 sclerociliary, internal fistulization from, (65).
 iridotaxis, sympathetic ophthalmia after, 430, 715.
 results of, (179), 1072.
 sclerectomy, Elliot's, (540).
 histopathology after, (641).
 the seton in, (939).
 Szymanski modification, (359).
 seton, 400.
 on trachomatous eyes, (438).
 trephining, nonformation of anterior chamber after, (946).
 physiochemical constant of blood in, (269).
 preglaucomatous eye, 338.
 prodromal, (541).
 secondary, 335.
 to iridocyclitis, (945).
 uveitis and, with absorption of lens, 1114.
 tension, (541).
 choroid in, (181).
 consensual reaction of, (1028).
 effect of, diathermy on, (66).
 Doryl (Merck) on, (269), (438), (916).
 extraocular factors on, (918).
 mydriatics on, 37, (359).
 sodium-chloride injections on, (1028).
 hypertension, glaucoma without, 612.
 in fatigued subject, (1047).
 in pregnancy, (1045).
 and retinal circulation, (947).
 treatment of, medical, (268).
 adrenal cortex, (360).
 amyl nitrite, (180).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Glaucoma,
treatment of, (*Continued*).
autohemotherapy, (269).
Doryl, (269), (438), (916).
in Czechoslovakia, (947).
glaucosan, (540).
gravidan, (732).
pilocarpine collyria, (179).
Glaucosan, 58, (540).
Glioma, cysticercus simulating, (734).
of iris, (189).
of optic nerve, (82), (829).
of retina, 49, (82), (446), 830, (1043), 1114.
bilateral, 48.
radiotherapy cure of, (1043).
radium for, (82).
routes of metastasis in, (445).
Gliosis of retina, (362).
Gloves in eye surgery, (718).
Glucose in aqueous and vitreous, 975.
Glutathione, in blood, in ocular disease, (360).
in lens, (271), (1029).
in ocular tissues, (277).
Glycemia and cataract, (181).
Glycides of occipital lobe, visual function and, (626).
Goethlin test of tuberculosis, (913).
Goiter, exophthalmic, see Thyroid.
Gold, sodium thiosulphate, for nontuberculous uveitis, (730).
for tattooing of cornea, (934).
Gonin, Jules, (88).
operation, see Retinal detachment.
Goniophotography, 787, (910).
Gonioscopy, 371, 481, 583, 786, (910).
Gonorrheal ophthalmia, see Ophthalmia.
Gordius robustus, human parasitism with, (449).
Gout, ocular inflammation from, (1135).
Graefe, A., (453).
contemporary critics of, 159.
letters to Donders, (90), (452).
Gradenigo's syndrome, see Syndrome.
Granuloma, of conjunctiva, (279), (930).
from embedded cilium, (1044).
of orbit, (276).
Gravidan therapy, (167), (437), (539), (732).
Green patch, see Fundus.
Groenouw's disease, see Keratitis.
Grönholm, Väinö, (838).
Grudzinski method of localizing foreign bodies, see Injuries.
Guist operation, see Retinal detachment.
"H-K. no. 1," (918).
Harada's disease, (273).
Hay fever, see Allergy.
Headache, 93, (273).
Head injuries, see Injuries.
Headnodding, congenital, and nystagmus, (926).
Heine's cyclodialysis, (269).
Hemangioma of orbit, (77).
Hematology, see Blood.
Hematoma, of optic-nerve sheath, (84).
subepithelial corneal, (86).
Hemeralopia, in Laurence-Moon-Biedl syndrome, (184).
nitroglycerine for, (1140).
and vitamin-A deficiency, 617, (817), (1144).
Hemianopsia, altitudinal, after occipital injury, (276).
with aphasia, (76).
binasal, 336.
in tuberculous meningoencephalitis, (276).
homonymous, from brain tumor, (625), (823), (1144).
symmetrical, effect of, on nystagmus, (722).
Hemophthalmus, 1014.
Hemorrhage, into anterior chamber, post-operative, (919).
after curetting meibomian cyst, (630).
expulsive, (947).
gastric, etc., amblyopia after, (822).
intraocular, with epidemic dropsy, (1137).
postoperative, (1143).
leptomeningeal, (545).
retinal, (545), (547), 801, (944), (1038).
and general disease, (73), (184), (1036).
juvenile, 50, (273).
recurrent, (273), 607.
striate, in papillo-macular region, 1017.
into vitreous, (273).
Hemp, hypersensitivity to, (1047).
Henna, hypersensitivity to, (1044).
Hernia, orbitocranial, (187).
Herpes, corneal, (729).
traumatic, (729).
treatment, (536), (935).
zoster, corneal, (178).
ophthalmicus, basal radiculomeningitis with, (833).
convalescent blood for, (934).
radiotherapy in, (933).
traumaticus, (436).
retrobulbar neuritis from, (275).
short-wave radiation for, (265).
Heterochromia of iris, (944).
Fuchs's, (730), (1135).
Heterophoria, and anisophoria, (910).
with dominance of one eye, (722).
Maddox-rod and diploscope tests of, (174).
High-frequency-current therapy, (169).
Hospitals, see Eye hospitals.
Hunger, effect of, on vision, (638).
Hutchinson, Sir Jonathan, (88).
Hyaline bodies, see Drusen.
Hyaline membranes of cornea, 608.
Hyaloid artery, epipapillary membrane and, (70).
Hyaloid canal, with area Martegiani, (365).
in men and animals, (454).
Hydrochloride of methyloctenylamin, mydriatic, (165).
Hygiene, sociology, education, and history, (88), (282), (451), (640), (835), (1048).
Hypacusia, angiosclerotic ocular lesions and, (87).
glaucoma and, (87).

- Explanation:** Numbers in heavy type refer to original articles, parenthetical numbers to abstracts
- Hyperopia**, apparent increase of, in children, 1106.
 rapid decrease in, (352).
- Hyperphoria**, esotropia and, 803.
 with overaction of inferior oblique, 251.
- Hyperpnea**, effect of, on vision, (1126).
- Hyperpyrexia** after atropine, 247.
- Hypersensitivity**, see Allergy.
- Hypertension**, essential, 339.
 and fundus picture, (362), (815), (1032).
 ophthalmoscopy of, (736).
 retinal angioscopy in, (1140), (1141).
 toxemia of pregnancy, (735), (1140).
- Hyperthyroidism**, see Thyroid disease.
- Hypophysis**, cachexia, cataract with, (271).
 extract of, effect on eye, (1125).
 tumors of, 429, 801.
 optic atrophy with, (73), 801.
 roentgenologic and ophthalmologic signs in, (1144).
 and see Brain.
 and visual apparatus, (1038).
- Icterus** and pupillary membrane, (268).
- Idiosyncrasy**, diocaine and, (167).
- Illumination**, chromatic, in industries, (641):
 of color-test charts, (919).
 in correction of presbyopia, 238.
 and miner's nystagmus, (533).
 of operative field, (528).
 ophthalmoscopic, (347).
 optimum, for optimum visual efficiency, (283).
 transillumination in retinal detachment, (273), (273), (911).
 for visual-test charts, (914).
 and see Light.
- Immunity**, see Allergy.
- Inclusion bodies**, 1.
 in ophthalmia neonatorum, (61), (1130).
 and see Trachoma.
- India**, (1138), (1139).
- Industry**, injuries in, see Injuries.
 and see Compensation.
- Infections**, postoperative endogenous, 328.
 and see Focal infections.
 and see Nasal accessory sinuses.
- Infrared**, injury of eye from, (448).
 and see Photography.
- Injuries**, (84), (189), (280), (447), (635), (831), (1043).
 aniline pencil, (447).
 argyrosis of conjunctiva, (85), (263), 802.
 birth, vitreous bands in anterior chamber, (280).
 cataract, electric, (85), (1043).
 traumatic, (85), 335.
 Vogt's contusion rosette, (1045).
 X-ray, (85), 739, (1124).
 of ciliary body, cyclectomy, (635).
 cilium, in anterior chamber, (449), (635), (637).
 embedded in conjunctiva, (1044).
 conjunctival, (189), (1044).
 contusions, hemophthalmus after, 1014.
 minor sequelae of, 757.
 old, 1014.
- Injuries**, (*Continued*).
 of cornea, chemical, (635).
 in newborn, (1045).
 from cosmetics, 894, (1044).
 hematoma, (86).
 laceration, 427, 703.
 mustard-gas blindness, (189).
 perforating, (635).
 puncture by wasp, (280).
 sensitivity, (636).
 silicosis of, 896.
 wounds, blepharoplasty to cover, (449).
 reticulo-endothelium in repair of, (1131).
 cranial, see head.
 electric, cataract, see cataract.
 welding, (190), (191), (636).
 of eye, caustic, (280).
 in children, (191), (635).
 from compressed air, (1044).
 earning capacity after, (89).
 estimation of, (90).
 industrial, see industrial.
 pathologic findings after, (448).
 action of phenol on, (280).
 rare, (448).
 from sports, (640).
 fireworks, (831).
 foreign body, in anterior chamber, cilium, (449), (635), (637).
 magnet, (1043).
 in cornea, posterior, (190).
 intraocular, copper, (450).
 explosion of, (447).
 extraction of nonmagnetic, 1110.
 localization, (449), (637), (832), 897.
 magnetic, 40, 337, (447), (636), (832), 1115.
 cyclitic membrane after removal, 897.
 magnets, (450), 517, (637), (832).
 multiple, 606.
 in orbit, 250.
 wood, (637).
 perforating, caterpillar hairs, (448).
 lymph follicles following, (86).
 spectacle glass, (190).
 wheat awn, (448).
 against sclera, 898.
 in the vitreous, removal, (637), (833).
 gases, war, (635), (832).
 of head, accommodative asthenopia from, 385.
 visual disturbance after, (86), (822), 1113.
 hemp, hypersensitivity to, (1047).
 henna, hypersensitivity to, (1044).
 horseshoe, (448).
 industrial, (836).
 adaptation delayed, (85).
 chemical freezing of eye, 881.
 compensation for, (89), (90), (836).
 electrical, see electrical.
 lens opacities from heat, (85).
 metal workers, (190).

Explanation: Numbers in heavy type refer to original articles, parenthetical numbers to abstracts

- Injuries,
 industrial, (*Continued*).
 in specified plants, Gorki autoworks, (636)
 Manometr, (831).
 Red Star, (637).
 soda factory, (447).
 synthetic rubber, (837).
 of iris, bullet, (191).
 iridodialysis, (86), (281).
 prolapse, 895, (1044).
 of lens, abscess, (86).
 dislocation, (636), 895.
 from ultraviolet rays, (636).
 xanthomatosis, (86).
 and see cataract.
 of lids, from henna dye, (1044).
 by hooks, (448).
 lightning, see electric.
 ocular, see eye.
 of optic nerve, avulsion, (280).
 rupture, (449).
 sheath, (84).
 orbital, gunshot wound, 1111.
 parasitization with *Gordius robustus*, (449).
 paralysis of muscle from indirect trauma, (281).
 penetrating, meningeal reaction, (832), (940).
 pneumophthalmos, (189).
 from ratbite, (448).
 from radiant energy, (1044).
 of retina, postoperative, (832).
 traumatic angiopathy, (449).
 of sclera, rupture, (636), (637).
 wounds, blepharoplasty to cover, (449).
 from silver nitrate, (1045).
 from ultrashort waves, (449), (636).
 from ultraviolet rays, (85), (636).
 and infrared light, (448).
 from X-rays, (1124).
 Integration, binocular, (920).
 International Societies, Association for Prevention of Blindness, 738.
 campaign against trachoma, 738.
 Interstitial keratitis, see Keratitis.
 Intracapsular extraction, see Cataract.
 Intraocular foreign bodies, see Injuries.
 Intraocular pressure, see Glaucoma.
 Iodine treatment of herpes corneae, (536).
 Iontophoresis, (915).
 glauconan, (540).
 zinc, in blepharitis, (444).
 Iridectomy, detachment of lens-capsule lamella during, (440).
 histopathology after, (641).
 Zirm's, (180).
 Iridencleisis, see Glaucoma.
 Iridochoroiditis after pyelonephritis, (944).
 Iridocyclitis, after cataract extraction, 898.
 with hypertension, dental origin, (943).
 in infantile polyarthritis, (942).
 after needling, 50.
 osmotherapy for, (940).
 rheumatic, (944).
 and secondary glaucoma, treatment, (945).
 Iridocyclitis, (*Continued*).
 spondylarthritis and, (65), (438), (939).
 visual fields in, (942).
 Iridocorneosclerectomy, see Glaucoma.
 Iridodialysis, traumatic, reattachment, 52, (281).
 Iridotaxis, see Glaucoma.
 Iridotomy, (948).
 Iris, anomaly of, (942).
 aniridia, accommodation in, (719).
 congenital, (268).
 atrophy of, with glaucoma, 157.
 progressive, (731).
 bombé, (538).
 circulus arteriosus of, (267).
 coloboma, 900.
 culture of, (451).
 cyst, congenital, 287, 512.
 multilocular, 512.
 spontaneous, (267), (538).
 traumatic, (178).
 diabetic rubeosis of, (538), (638).
 hernia of, after cataract extraction, (68).
 heterochromia, see Heterochromia.
 injuries, see Injuries.
 nerve supply of, (284).
 position of, (171).
 prolapse, experimental, (1044).
 reattachment of, nonsurgical, (281).
 Sanarelli-Schwartzmann phenomenon in, (348).
 tumors of, see Tumors.
 Iritis, experimental, 1060.
 gonorrheal, annular opacity without injury in, (941).
 metastatic, (267), (731).
 recurrent, (438).
 from subconjunctival bullet, (191).
 syphilitic, in Marfan's syndrome, (943).
 treatment, gravidan, (539).
 osmotherapy, (940).
 visual fields in, (942).
 Ishihara plates, (720).
 effect of illumination on, (919).
 Italy, decrease of trachoma in, (453).
 Ivory Coast, onchocerciasis on, (638).
 Japan, trachoma measures in, (283).
 Jean Matejko, vision of, (837).
 Jensen's retinochoroiditis juxtapapillaris, (272), (273), (733), (1144).
 Kahn reaction in ophthalmology, (639).
 Kala-azar infection, ocular symptoms due to, (272).
 Kalisz, trachoma in, (283).
 Kankrov's surgery of lacrimal passages, (1040).
 Kaunas clinic, see Clinic.
 Kayser-Fleischer ring, see Cornea.
 Keratitis, (937).
 band, in infantile polyarthritis, (941).
 benzyl ester of cinnamic acid in, (167), (168).
 bullous, 16, (356).
 dendritic, (176), (536), (935).
 disciform, (938).
 quinine therapy for, (530).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts.

- Keratitis, (*Continued*).**
 familial, (356).
 filamentary, (176), (933).
 furrow, with ectasia of cornea, (728).
 herpetic, (436), (437).
 radiotherapy in, (933).
 interstitial, (837).
 choroidal complications of, (727).
 etiology of, (64).
 initial symptomatology, (266).
 from latent infection, (437).
 with Marfan's syndrome, (943).
 "palm-leaf," (63).
 and pupillary membrane in cat, (937).
 pustuliform, (65).
 with retinal hemorrhage and exudate, 801.
 with saber shins and yaws, (536).
 social significance of, (938).
 therapy, (177).
 fever, 704.
 massage, (531).
 quinine, (530).
 Schieck's autohemotherapy, (728).
 tuberculous, (537).
 malarial, (436), (729), (936).
 marginal, (64), (178).
 of nasal origin, (537).
 neuromyolytic, (178).
 nodular, Groenouw's, (177), (1131).
 nummularis, (728).
 osmotherapy for, (915).
 profunda, sclerosing, (1135).
 punctate, superficial, (935).
 vitamin A for, (729).
 purulent, reticulo-endothelial system and, (936).
 Speranskii therapy, (176).
 ultraviolet therapy for, (1131).
Keratoconjunctivitis, with adenitis, in Calcutta, 982.
 diversiformis, epidemic, 1007.
 eczematous, (62).
 lupoid, (1130).
 phlyctenular, treatment, (1129).
 pseudomembranous, from wood, (828).
 sicca, (356), (356).
 staphylococcic, (535).
Keratoconus, 704, (933), (1132).
 contact glasses for, 52, 422.
 diagnosis of, (265).
Keratohypopyon, therapy, (1132).
Keratomalacia, (1134).
 in adults, (727).
Keratoma, senile, (1145).
Keratome, curved, for sclerectomies, (359).
Keratoplasty, (63), 705, (934).
 full thickness for corneal dystrophy, (1132).
 partial, penetrating, (63), (1132).
 trephine for, (728), (938), (1132).
Keratoscope, (912).
Kidney function and ophthalmology, (1045).
Kinescopy, see Refraction.
Knapp cataract extraction, see Cataract.
Koch bacillus in trachoma, (355).
Krompecher's basalioma, (632).
Krukenberg's spindle, (64), (935).
Lacrima, (828).
 lysozyme content of, 634.
Lacrimal canaliculi, fungus infection of, 418, (630), (1145).
 supernumerary, (80).
Lacrimal duct, restoration of, 515.
 stenosis, congenital, when to probe, 1009.
 spiral cannula for, (629).
Lacrimal glands, alcohol injections of, for epiphora, (445).
 biomicroscopy of orifices of ducts, (188).
Lacrimal passages, conservative treatment for, (79), (80).
 function of, in winking, (444).
 musculature of, (368).
 surgical treatment of (Kankrov's), (1040).
Lacrimal puncta, (80).
 anomalies of, (278).
Lacrimal sac, abscess, (75).
 cholesterin crystals in, (80).
 dacryocystitis, (826).
 Callahan tubes for, 601.
 following maxillary sinusitis, (1041).
 of the newborn, (79).
 in Warsaw clinic, (187).
 dacryocystorhinostomy, (277), (629), (826), (827), (827), (828), (828).
 extirpation of, lacrimation after operation for, (277).
 by surgical diathermy, 699.
 phlegmon, short-wave therapy for, (1041).
 tumors of, see Tumors.
Lacrimation, Arruga's operation for, (277).
Lagleyze-Hippel disease, (272), (733).
Lamp, for cataract surgery, 770.
 focal, for after-ataract operations, (812).
 to illuminate operative field, (528).
 ultraviolet, (949).
Larocaine, (169).
Lastex bandage for eyes, (349).
Lauber-Henning prosthesis, (628).
Laurence-Biedl syndrome, see Syndrome.
Lead, poisoning, from hair dyes, (822).
 retinal changes in, (736).
 sugar of, corneal opacities from, (1134).
Leber's disease, (275).
Leishmania, edema of lids due to, (79), (79).
 septic neuroretinitis from, (272).
Leishmaniosis of skin of lids, (79), (631), (1145).
Lens, absorption of, uveitis and glaucoma with, 1114.
 accommodation, 245.
 animal, vitamin C in, (66), (67).
 antigen, effect on senile cataract, (68).
 in astigmatism, (921).
 biochemistry of, (542), (543), (1029).
 ascorbic acid in, (85), (361).
 flavin content of, (361).
 glutathione in avitaminosis C, (271).
 phosphate, (812).
 phospholipid content of cataractous, (271).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

Lens,

- biochemistry of, (*Continued*).
- vitamin B deficiency of, (361).
- vitamin C, in cataractous, (67).
- deprivation of, (270).
- formation of, (271).
- in calcium-potassium solution, (733).
- capsule, detachment of lamella of, (440).
- perilenticular, embryonal, (439).
- permeability of, (733).
- coloboma of, (362), 900.
- congenital bubble of, (948).
- developmental defects of, (543).
- dislocation, in arachnodactyly, (66), (440), 705, (732), (947), (948).
- lentic iris changes in, (943).
- into anterior chamber, (949).
- spontaneous, recurrent, (360).
- effect of, cystin deprivation on, (270).
- naphthalin on, (67).
- vitamin C deprivation on, (270).
- extract, sensitivity to, 782.
- extraction of, (949).
- injuries, see Injuries.
- lenticonus, (439), (812).
- lentiglobus anterior, (1138).
- luxation, see dislocation.
- mobility of, during accommodation, (350).
- opacities, cholesterolin in, (947).
- congenital, (68).
- measurement of, (527).
- pigment deposits on, (939).
- problem of, (452).
- protein, effect of ultraviolet radiation on, (1029).
- senile, relation of adrenalin to coloring of, (733).
- synechiae between rim of optic vesicle and, (839).
- thickness of, effect on total refraction, (721).
- tremulous, (361).
- and see Cataract.
- and see Abstracts, section nine.
- Lenses, see Spectacle lenses.
- Lentin, see Carbaminoylecholin.
- and see Doryl.
- Leprosy, ocular, (1047).
- Leptomeningeal hemorrhage, (545).
- Leslie Dana Gold Medal award to Dr. John M. Wheeler, 644.
- Leucosarcoma of choroid, (447).
- Leukemia, ocular changes in, (450).
- Levoglaucosan, see Glaucosan.
- Lids, abscess, short-wave therapy in, (1041).
- closure of, in mastication, (631).
- reflex, of the pupil, 338.
- coloboma of, (78).
- plastic repair of, (444), (1040).
- crutch for, (368).
- degeneration of, amyloid, (444).
- dyschromias of, and ciliary poliosis, (630).
- ectropion, cicatricial, from mucocoele, (828).
- operations for, (79), (827).
- edema of, in trachomatous subject, (277).
- elastic fibers of, in animals, (78).
- entropion, operations for, (187), (630), (631).
- gangrene of, (444), (1041).
- keratoma of, (1145).
- leishmaniosis of, (79), (79), (631), (1145).
- lupus erythematosus of, 802, (827).
- milker's nodule on, (79).
- plastic surgery of, (187), (444), (444), (445), (825), (916), (1145).
- pseudo horn of, (188).
- pseudotumor of, recurring, (368).
- ptosis, congenital, experimental, (631).
- hereditary, 597.
- incomplete, (629).
- in familial facial diplegia, (1041).
- operations for, 153, 660, (828), (1041), (1042), (1145).
- pyodermatitis of, (175).
- reticular fibers of, (1050).
- slit, direction of, in congenital lues, (80).
- of the Negro, (828).
- tick on, (282).
- trichiasis, (187), (630), (1041).
- tumors, see Tumors.
- upper, cilium in tarsus of, (631).
- movements of, physiology, (630).
- Light, colored, binocular summation with, (924).
- red, effect on photographers, (1049).
- effect of intense, on adaptation of eye, (531).
- on amino-acid content of retina, (1126).
- electrical response of eye to, (352).
- eye physicians selling, 700.
- infrared, see Infrared.
- optimum, 807.
- polarized, ophthalmoscopic examination with, (166), (717).
- rays, effect of, on eye, (169).
- response of visual-sense cell to wave lengths of, (921).
- sense, in arteriosclerosis and malaria, (527).
- stimulation, for perimetry, (166).
- tolerance of, in exophthalmic goiter, 460.
- in the nonphotophobic, 407.
- ultraviolet, see Ultraviolet light.
- use of selective yellow, in ophthalmology, (1122).
- and see Illumination.
- "Lightning streaks," subjective, (173).
- Limbus, edema of, (1129).
- Lipemia of retina, 645.
- blood fat in, (546).
- Lipodystrophia, ocular complications in, 126, (450).
- Lipoids of retina, (364).
- Lipoma, of orbit, (81).
- subconjunctival, (80).
- Localization, see Foreign bodies.
- and see Retinal detachment.
- London eye hospitals, defunct, (454).
- Los Angeles Society of Ophthalmology and Otolaryngology, 249, 703, 1009.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Loupe, (911).
 and head mirror, 152, (718).
 Luës, see Syphilis.
 Luminol anesthesia, (915).
 Luminous dial, (717).
 Lupus, erythematosus, of cornea, (264).
 of eyelids and conjunctiva, 802, (827).
 ocular diseases in, (835).
 Lymph follicles, formation of, in eye, (86), (445).
 Lymphadenosis, leukemic, ocular complications of, (1042).
 Lymphangioendothelioma of lid, (84).
 Lymphogranulomatosis, eyeground changes in, (1035).
 Lymphoma, of conjunctiva, (929), (1128).
 of the eye, (83).
 Lysates, bacterial, (535).
 specificity of, (915).
 therapy, in retinitis pigmentosa, (817).
 use of, in ophthalmology, (916), (917).
 Lysozyme content of tears, 684.
- Macula lutea, coloboma of, (268), (545).
 in twins, (815).
 degeneration, familial, (182).
 progressive, (734).
 hereditary, 216, (440), 611, (1144).
 detachment of, 195.
 edema of, retinographic recording of, (273).
 hole in, formation of, 457.
 optokinetic reactions with, (1128).
 holelike affection of, (816).
 Maddox rod, in heterophoria, (174).
 red multiple, with prism, (353), (926).
 Magnet extraction of foreign bodies, see Injuries.
 Maher operation, see Entropion.
 Malaria, effect of akrichtin therapy for, (621), (622).
 light sense in, (527).
 melano-flocculation test for, (528).
 ocular changes in, (88), (281), (450).
 plasmocide for, (185).
 retinal hemorrhages in, (1036).
 therapy, for interstitial keratitis, 704.
 for tabetic optic atrophy, (275), (547).
 Malformations, ocular, (626), (736).
 Malingering, tests of, (527), (529), (913).
 Manhattan Eye, Ear, and Throat Hospital, (454).
 Marfan's syndrome, see Syndrome.
 Martegiani area, hyaloid canal with, (365).
 Massage treatment of eye, (531).
 Mastoiditis, Brown-Séquard syndrome from, (77).
 Matteson, Jean McNaughton, 715.
 Medical abstract journals, 713.
 Medical philosopher, 904.
 Medullated nerve fibers, (1037).
 Megalocornea, 155, 549.
 histologic findings in, (1133).
 Megalophthalmus, 155.
 Melanoepithelioma of orbit, (83).
 Melanoma, of choroid, (632), 1114.
 significance of argyrophile fibers in, (632).
 of iris, (829).
 Melanosarcoma, of choroid, (631), (1027).
 of disc, (83).
 of lid, (1042).
 Melanosis of eye, (87), (445).
 Memphis Society of Ophthalmology and Otolaryngology, 250, 335, 1114.
 Meninges and cerebrospinal fluid, (626).
 Meningioma of left parietal lobe, (624).
 Meningitis, after meningococcus conjunctivitis, 780.
 spinal, ocular complications after, 606.
 tuberculous, (358).
 Meningocele, blindness after operation for, 1017.
 Meningocephalocele, orbital, (629).
 Meningoencephalitis, tuberculous, (276).
 Mercurochrome in ophthalmia neonatorum, (725).
 Metabolism, fat, (87).
 in the glaucomatous, (947).
 Methyl antigen for trachoma, (175).
 Microcephaly, Kayser-Fleischer ring and, 26.
 Micrococcus catarrhalis conjunctivitis, (175), (724).
 Microcornea, familial, (265).
 Microphthalmos, anophthalmos and, 249.
 embryonic formation of synechiae in, (839).
 etiology, (826).
 malformations in, (628).
 unilateral, (1144).
 Microscope, binocular, for eye surgery, (718).
 corneal, for gonioscopy, 371.
 Midwinter course, Los Angeles, 342.
 Migraine, ophthalmoplegic, (823), (1128).
 Millingen-Sapeshko operation, 631.
 Minnesota Academy of Ophthalmology and Otolaryngology, 51, 420, 513, 705, 1009, 1111.
 Miotics, carbaminoylcholin (Doryl), (269), (438), (916).
 effect of, on accommodation and retina, (719).
 Prostigmin, (918).
 Moll's gland, adenoma hydradenoides of, (630).
 Monkeys, infectivity of trachoma in, (724), (724).
 structure of retina in, (838).
 Mononucleosis, ocular-muscle paralysis from, (353), (927).
 Montaña, Emilio F., 909.
 Morax, Victor, (88), (89), (89).
 Motais operation for ptosis, see Ptosis.
 Motorists, see Automobile drivers.
 Mountain climbing, eye protection in, (191).
 Moving pictures, see Cinematography.
 Mucocele, of ethmoidal sinus, (87), (1144).
 paralysis of left superior oblique from removal of, 800.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

Mucocele, (*Continued*).

of frontal sinus, cicatricial ectropion from, (828).

Multiple sclerosis, see Sclerosis.

Muscles, balance, determination of, (1122).

ciliary, action of, (59).

diagram of action of, (353), (533).

dilator of pupil, (829).

extraocular, (838), 908.

change in, in periarteritis nodosa, (354).

proprioceptive sense in, (922).

in hog and wild boar, (1050).

imbalance, screen test of, 653, 803.

inferior oblique, hyperphoria with over-action of, 251.

nystagmus, see Nystagmus.

oculomotor spasm in Gradenigo's syndrome, (533).

operation, (928).

advancements, (60).

Denig's, (721).

forceps for, (353), (926).

recession, 689.

tendon transplantation, (927).

tenorrhaphy, (174).

orbicularis, excision of tarsal part for trachoma, (630).

nerve supply of, (630).

orbital, insertion of, (839).

palsy, see paralysis.

paralysis, of conjugate movements, (928).

divergence, of functional origin, 789.

of external muscles, etiology, (174).

migrainous, (823), (1128).

operation for, (927).

from infectious mononucleosis, (353), (927).

traumatic, (281).

after mucocele removal, 800.

paresis, of external rectus after spinal anesthesia, (927).

operation for, 613.

rectus, anomaly of right external, 613.

biomicroscopy of, (348).

surgery of, (927).

and see Ocular movements.

and see Strabismus.

Museum, ophthalmologic, (837).

Mydriasis, paradoxical, (170).

Mydriatics, adrenalin, (165), (170).

effect of, on tension, 37, (359).

ephedrine, (165).

hydrochloride of methyloctenylamin, (165).

suprarenin bitartrate, 311.

sympathicomimetic substances, (165), (170).

Myiasis, conjunctival, (1048).

Myoblastoma of orbit, (446).

Myocampter for concomitant strabismus, (353).

Myopia, 419, (919).

in China, (923).

constitutional factor in, (173).

Myopia, (*Continued*).

control of, (352), (922).

correction, by convex lenses, (720).

for near, (351).

and exophoria, (173).

Fuchs's black spot in, (718).

genesis of, (352), (532).

high, Fuchs's black spot in, (922).

monocular, (171).

and near work, (173).

nineteenth-century conception of, (1050).

perforation of retina in, (70).

in porters, (283).

progressive, acquired, 20 D., (719).

etiology, (1123).

full correction to check, (173).

vocation and, (173).

Myotonia dystrophica with cataract, biomicroscopy, (270).

Naphthalin, ocular changes from, and vitamin C, (67).

Nasal accessory sinuses, antrum, tumor of, involving eye, (833).

cavernous, thrombophlebitis of, (628).

thrombosis of, 256.

disease of, and choked disc, (820).

and ocular involvement, 901.

ethmoidal, mucocele of, (87), (1144).

exophthalmos from, (627), (824).

frontal, mucocele of, ectropion from, (828).

new-formed bone in, (1039).

osteoma of, (1039).

maxillary, dacryocystitis following inflammation of, (1041).

retinal edema from, (734).

optic neuritis from, (621).

orbital complications from, (824).

relationship of eye to, 901, 901.

sphenoid, ocular symptoms from, (823).

tumors, see Tumors.

and see Focal infection.

Nasal-nerve syndrome, see Syndrome.

Nasoretinal reflex, (1140).

National Society for the Prevention of Blindness, (836).

Needle holder, 158, (530), (919).

Negroes, lid slit of, (828).

Neoarsphenamine in nonsyphilitic uveitis, (943).

Nephritis, ocular complications of, (1032), (1033).

Nerve, fibers, medullated, (1037).

sixth, paralysis, congenital, (723).

third, paralysis, 423.

Neuralgia from tuberculous toxins, (638).

Neuroangiopathy, monocular, (267).

Neuroblastoma, ocular complications of, (446).

Neurodermatitis, cataract with, (810).

Neuroepithelioma, see Glioma.

Neurofibroma, conjunctival, 899.

familial, (82).

of optic nerve, (632).

Neurofibromatosis, see Recklinghausen's disease.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Neuroma, (76).
 Neuroretinitis from papular fever, (1046).
 Neurosyphilis, pupils and central fields in, (913).
 Neurotropic lesions and novocaine blocking, (170), (176).
 Nevocarcinoma of lid, (81).
 Nevus, angioma of choroid with, (65).
 of bulbar conjunctiva, (445), (446).
 cystic, of semilunar fold, (1042).
 flammeus, buphthalmos with, (180).
 glaucoma with, (359), (540).
 and megalocornea, 155.
 New England Ophthalmological Society, 159, 516, 704, 804, 111.
 New York Academy of Medicine, Section of Ophthalmology, history of, (452).
 New York Eye and Ear Infirmary, (454).
 New York State, sympathetic ophthalmia in, (358).
 News Items, 92, 192, 285, 369, 455, 548, 644, 738, 840, 950, 1051, 1146.
 Nictitating membrane, (60).
 Niemann-Pick's lipoidosis, (72).
 Night blindness, see Hemeralopia.
 Ninni's biologic test of aqueous and vitreous, (1122).
 Nitrocellulose for embedding, 153, (165).
 Nitroglycerine for hemeralopia, (1140).
 Novocaine, blocking, (170), (530).
 isobutyrate form for instillation of, (917).
 phenylpropionate form for injection of, (917).
 Nystagmus, effect of oxygen content of air, on, (533).
 and head tremor in children, (926).
 miners', effect of vision and illumination on, (533).
 optokinetic, effect of symmetrical hemianopsia on, (722).
 and hole in macula, (1128).
 in mesencephalic lesions, (1127).
 Obituaries (see also Deaths)
 Barkan, Adolf, 260.
 Matteson, Jean McNaughton, 715.
 Montaño, Emilio F., 909.
 Snydacker, Emanuel Frank, 714.
 Velez, Daniel M., 908.
 Wilmer, William Holland, 522.
 Worth, Claud A., 1025.
 Occipital lobe, glycodes of, and vision, (626).
 Ocular dominance, (923).
 Ocular fatigue, see Fatigue.
 Ocular fluids, nature of, 859.
 precorneal layer of fluid, (828).
 Ocular movements, (60), (174), (353), (533), (721), (926), (1127).
 anglometer, (923).
 galvanometric method of recording, (1128).
 scheme for (926).
 Ocular tension, see Glaucoma.
 Ocular tissue, culture, effect of diphtheria toxin on, (451).
 precipitins in, 852.
 Oculomotor, see Muscles.
 Oestrus ovis, (1048).
 Oligodendrocytoma of orbit, (279).
 Onchocerciasis, conjunctival lesions in, (638).
 Opacities, measurement of, (527).
 Operations, intraocular, affections of fifth nerve and, (1046).
 asepsis of conjunctival sac in, (1125).
 bandage after, (169).
 luminal anesthesia for, (915).
 plastic marginal, (187).
 and see Surgery; and see Abstracts, section two; and see also under individual subjects, such as Cataract, Glaucoma, Lids, Retina, or the personal name associated with the particular operation.
 Ophthalmia, from aspirin sensitivity, (1131).
 eruptive fever with, (281).
 gonorrheal, bacteriological study of, (435).
 in adult, 335.
 endogenous, 328.
 local heat for, (931).
 metastatic, in pneumonia, (358).
 neonatorum, (837), (1045).
 gonococcus filtrate for, (535).
 inclusion bodies in, (61), (1130).
 mercurochrome for, (725).
 sympathetic, see Sympathetic ophthalmia.
 Ophthalmic errors, 129, (640).
 Ophthalmodynamometer, (913).
 internal medicine and, (914).
 Ophthalmodynamotonometer, (718), (913).
 Ophthalmological societies
 American Academy of Ophthalmology and Otolaryngology, 1021.
 American Medical Society, Section on Ophthalmology, 521.
 Baltimore, 608.
 Chicago, 155, 337, 517, 611, 1014.
 Colorado, 50, 426, 606, 798, 897, 899, 1017.
 Egypt, 1935 bulletin, 344.
 French, 1935 bulletin, 433.
 Los Angeles, 249, 703, 1009.
 Memphis, 250, 335, 1114.
 Minnesota, 51, 420, 513, 705, 1009, 1111.
 New England, 158, 516, 704, 804, 1111.
 Philadelphia College of Physicians, 47, 48, 153, 512, 707, 801, 901, 1109.
 Pittsburgh, 336.
 Research, see Association for Research in Ophthalmology.
 Royal, 52, 251, 424, 518, 609, 1010.
 Saint Louis, 338, 428, 518, 902.
 Washington, D.C., 423, 802, 1113.
 Western, 342.
 and see News Items.
 Ophthalmologist, selling light, 700.
 short courses for, 808.
 Ophthalmology, ancient writings on, 618, (1049), (1050).
 antivirus therapy in, (350).
 blood transfusion in, (834).
 developments of, in Bengal, (453).
 in fifty years, (454).
 dyslipidoses and, (1036).
 and experimental psychology, (59).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Ophthalmology, (*Continued*).
 focal infections in, (639).
 founder of modern, (453).
 history of, (89).
 contribution of Sir Jonathan Hutchinson to, (88).
 miracle in medieval England, (283).
 infrared photography in, 513.
 ionization in, (915).
 Kahn reaction in, (639).
 kidney function and, (1045).
 lysates in, (916), (917).
 polarized light in, (717).
 quackery in, 1121.
 rheumatism and, (944).
 rôle of vitamins in, (282).
 short-wave therapy in, (1041).
 teaching of, graduate, 808.
 undergraduate, 57.
 textbooks of, 259, 1022, 1024.
 vitamins in, (833), 1019.
 X ray in, 809.
 and see Abstracts, section eighteen.
- Ophthalmomyiasis, (451).
 externa, (1048).
 interna, (835).
 migrans, (1045).
- Ophthalmoplegia, external progressive, 518.
 total, after lethargic encephalitis, (1127).
 syphilitic, (723), 800.
- Ophthalmoscope, (718).
 electric, diaphragm for, (1123).
- Ophthalmoscopy, in diagnosis of systemic disease, 302, 432.
 illumination for, (347).
 with polarized light, (166), (717).
 red-free, (165).
- Ophthalmotonometry in ocular tuberculosis, (718).
- Optic atrophy, see Optic-nerve atrophy.
- Optic canal, roentgenography of, (911).
- Optic chiasm, see Hypophysis.
- Optic localization of fixation point, (352).
- Optic nerve and toxic amblyopias, (73), (185), (275), (366), (442), (547), (621), (820), (1037), (1144).
- Optic-nerve atrophy, with aneurysm of internal carotid, 1053.
 cataract and, 251.
 cavernous, (1037).
 congenital, 53.
 hereditary, (75).
 from hyperostosis of sphenoid, (824).
 Leber's, (275).
 Paget's disease with, (624).
 from plasmocide, (186).
 after rupture of lacrimal abscess, (75).
 surgical, (442).
 syphilitic, (837).
 tabetic, (275).
 depression therapy, (1144).
 pathogenesis and therapy, (821), (821).
 treatment, atropine, retrobulbar, (623).
 malaria therapy, (275), (547).
 from tumor of hypophysis, (73).
- Optic nerve, affections of, and roentgen diagnosis, (820).
- Optic nerve, (*Continued*).
 anatomy of, (90).
 in avitaminosis B, (275).
 coloboma of, and pecten in birds, (620).
 complication in spotted typhus, (833).
 disc, anomaly, (363), (623).
 choked, (622), (821).
 from chlorosis, (366).
 diagnosis, by protein in aqueous, (623).
 from epidemic dropsy, (1137).
 experimental studies on, 1109.
 with extracranial disease, 907.
 histopathology of, 708.
 in myelogenous leukemia, (451).
 in nephritic retinitis, (74).
 and optic neuritis, (621), (622), (821).
 with sinus disease, (820).
 syphilitic, (1037).
 transitory, (622).
 from tuberculous meningoencephalitis, (276).
 cupped, without glaucoma, (180), (1037).
 drusen, (74), (274), (1037).
 excavation, physiologic, (75).
 papillitis, (623).
 pigmentation of, (622).
 solitary tubercle at, (1037).
 disease, amyl nitrite for, (821).
 chromatic sense in, (73).
 chronaxia in, (75).
 low blood pressure and, (1037).
 in Kuban Eye Clinic, (821).
 effect of blood pressure on, (74).
 electrophysiology of, (1033).
 neuromyelitis of, (366).
 respiration of, (821).
 tumors, see Tumors.
 and see Brain tumors.
 water binding of, (623).
- Optic neuritis, in Kala-azar infection, (272).
 papilledema and, (622), (821).
 retrobulbar, acute, (275), (820).
 secondary to herpes zoster, (275).
 alcoholic, (74).
 peripheral blindness in, (76).
 inflammatory, (443).
 in posterior scleritis, (273).
 toxic, arsphenamine, (1038).
 plasmocide, (185), (186), (623).
 and sinusitis, (621), (621), 901.
 syphilitic, "green patch," (911).
- Optic pathway, decussation of, (367).
 electrical responses from, (350).
- Optic vesicle, embryonic synechiae from, to lens, (839).
- Opticians, licensing of, 343.
- Opticociliary neurectomy, histopathology after, (641).
- Optochin, action of, on metabolism of pneumococcus, (1124).
- Optometric propaganda, 603.
- Orbit, abscess of, (187), (1039).
 bone formation in, (277).
 cellulitis, (629).
 complications of, and sinusitis, (824).
 cyst, anophthalmos with, 1101.

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Orbit,
 cyst, (*Continued*).
 hematic, (368).
 hemorrhagic, (826), (830).
 hydatid, (281).
 development of, and size of eyeball, (643).
 hyperostosis of, (824).
 inflammations of, X-ray examinations, (1040).
 injuries, see Injuries.
 meningoencephalocele of, (629).
 muscles of, insertion, (839).
 phlegmon of, (824).
 plastic surgery of, (77), (367), (825).
 pyramid of, radiography, (166).
 structure of, (629).
 bony, (187).
 syphilitic processes in, (77).
 tuberculoma of, (627).
 varicocele of, (627).
 tumors, see Tumors.
 and see Abstracts, section thirteen.
- Orbitocranial hernia, (187).
 Orthoptic exercise, (60), (354), 714, (927), (928).
 in adults, 702, 989, 1014, 1015.
 screen parallax for, 1117.
- Osmotherapy, (915), (916), (940).
 Osteitis deformans, Paget's, and ocular changes, (75), (624), (1047).
 Osteoma, of frontal sinus, (1039).
 of orbit, (445).
 Osteomyelitis, tuberculous, orbital abscess in, (1039).
 Ostrooumoff formula for visual capacity, (1048).
 Otitis, purulent, ocular manifestations in, (639).
 Oxycephaly, see Crouzon's disease.
- Oxygen, excess, and nystagmus, (533).
 lack and visual intensity discrimination, (1126).
- Pacific Coast Oto-Ophthalmological Society, 1935 transactions, 163.
- Paget's disease, ocular manifestations in, (75), (624), (1047).
 Palestine, blindness, etc., in, (90).
 Pannus, see Cornea.
 and see Trachoma.
- Panophthalmitis, from colon bacilli, (940).
 from gas bacillus, (825).
- Pan-Soviet Institute of Experimental Medicine, research on the eye in, (643).
 Pantocaine, (529).
 harmfulness of? (84).
- Papilla, see Optic nerve.
 Papillary stasis, see Optic nerve.
 Papilledema, see Optic nerve.
 Papillitis, protein content of aqueous in, (623).
- Papino's conjunctivitis, see Conjunctivitis.
- Papular fever, ocular complications of, (1046).
- Paracentesis, 902, 1097.
- Paralysis of ocular muscles, see Muscles.
- Parasites, cysticercus, see Cysticercus.
- Parasites, (*Continued*).
 Dermacentor auratus, (282).
 echinococci, see Cysticercus.
 Filaria, (1045), (1048).
 loa, (281).
 Gordius robustus, (449).
 intestinal, pseudo-Argyll Robertson pupil, (539).
 larva, diptera, (1045).
 Oestrus ovis, (451), (1048).
 Onchocerca volvulus, (638).
 Wohlfahrtia magnifica, (835).
 and see Abstracts, section seventeen.
- Parenchymatous keratitis, see Keratitis.
- Paresis, see Muscles.
- Parinaud's, conjunctivitis, see Conjunctivitis.
- dermo-epithelioma, (830).
 syndrome, see Syndrome.
- Paris, eye services in, (451).
- Pemphigus, ocular, (62), (356), (932).
- Perception, color, anomalies of, (923).
 barometric pressure and, (925).
 congenital disturbances of, (1126).
 disturbances of, from tumors, (351).
 effect of auditory stimulation on, (1126).
 in normal and color blind, (172).
 test of, (352), 434, (532), (720), (922).
 and see Abstracts, section three.
- depth, norms of, (719).
 Pickard test for, (528).
 stereomyograph to determine, (1122).
- light, effect of auditory stimulation on, (1126).
- visual, (351).
 and see Vision.
- Perdrau-Ghigi's method of connective-tissue staining, (1123).
- Periarteritis nodosa, artery changes in extra-ocular muscles, (354).
 ocular complications from, (1046).
- Perimeter, hand, luminous point of fixation on, (165).
 mirror attachment for, (910).
 one-meter, 1005.
 scintillating, (912).
- Perimetry, evolution of, (837).
 by light stimuli, (166).
- Periphlebitis, retinal, (71).
 experimental tuberculous, (819).
 in septic endophthalmitis, (816).
- Periscope, in retinal-tear localization, (71).
- Perithelioma of conjunctiva, (278).
- Phacoëresis, see Cataract.
- Pharmacology, fixed pupil as test object in, (529).
- Phenol, action of, on eye, (280).
- Philadelphia College of Physicians, see College of Physicians, Section on Ophthalmology.
- Philadelphia Hospital for Contagious Diseases, scarlet fever sequelae in, (629).
- Phlyctens, significance of, (726).
- Phlyctenulosis, massage treatment for, (531).
 and see Keratoconjunctivitis.
- Phorias, anatomic, (927).
- Photographers, effect of red light on, (1049).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Photography, of eye for case records, 241.
 of fundus, (717).
 green color in, (347), (348), (911).
 stereoscopic, (347), (910).
 infrared, 513, (911), (912).
 of living lens and ciliary body in aniridia, (719).
 motion picture, see Cinematography.
 of the phorias, 44.
 Photometer, (911).
 Photophobia, adaptation and, 55.
 in a blind eye, (357).
 Photophthalmograph, (166).
 Physicians, postage stamps picturing, (640).
 Physiological optics, refraction, and color vision, (59), (171), (350), (531), (718), (919), (1125).
 Phytopharmacological test in ophthalmological lesions, 324.
 Pickard test for depth perception, (528).
 Pigment, epithelium, dispersion of, in glaucoma, (438).
 melanotic propigment, (447).
 migration in fundus disease, (912).
 Pilocarpine, clinical study of, (179).
 dosage, (946).
 Pittsburgh Ophthalmological Society, 336.
 Pituitary disease, see Hypophysis.
 Plasmocide, optic atrophy from, (186).
 optic neuritis from, (185), (623).
 Plasmocytoma, of conjunctiva, (279), (830).
 of eyelid, (829).
 Plastic surgery, see Surgery.
 Platinum tattooing, (934).
 Plica semilunaris, pathology of, (264).
 Pneumophthalmos, see Injuries.
 Pneumococcus, metabolism of, (1124).
 Poland, trachoma measures in, (284), (454), (643).
 Polyp, angiomatous, of lacrimal caruncle, (1042).
 Porterfield, William, 1109.
 Porters, eye condition in, (283).
 Postage stamps picturing physicians, (640).
 Posterior-commissure lesions, pupillary reaction to, (625), (823).
 Precipitins in ocular tissues, 852.
 Pregl's iodine solution, effect on retina, (274).
 Pregnancy, intraocular pressure in, (1045).
 retinal angiography in hypertension, etc., of, (1140).
 retinal arterial pressure in, (1045).
 retinal detachment in, (1141).
 toxemias of, (834).
 eye changes in, (735).
 visual-field defects in, (1045).
 Presbyopia, illumination in correction of, 238.
 meniscus spheres and, (925).
 Primates, retinal structure in, 157.
 Proprioceptive sense and vision, (922).
 Prosthesis, (826).
 disinfection of, (277).
 over infantile eye, 52.
 for lid and eyeball, (628).
 of orbit, (628).
 Prosthesis, (*Continued*).
 for protection, (642).
 stretching of conjunctival sac for, (443).
 throughout the ages, (277).
 over unsightly eyes, (628).
 Prostigmin, (918).
 Prowazek-Halberstaedter bodies, 1, 229, 428, (929), (1130).
 and see Blennorrhea.
 Pseudoadenoma of ciliary body, (633).
 Pseudo-Argyll Robertson pupil, (539).
 Pseudo-Graefe phenomenon, (630).
 Pseudoneuritis and papillitis, differential diagnosis of, (621).
 Pseudoxanthoma elasticum and angioid retinal streaks, (274), (364), (1032).
 Psychosis, bilateral amaurosis, (443).
 Pterygium, etiology, (175).
 recurrent, cataract extraction with, (68).
 Ptosis, see Lids.
 Pulse, ocular, (1039).
 Pupil, Argyll Robertson, etiology of, (625).
 fibers of, (625).
 in nonlucetic affections, (357).
 pathogenesis, (76).
 symptomologic value of, (165).
 contractions, pathways of, (624).
 stimulable by carbon dioxide in the blood, (437).
 diameter of, effect of doryl on, (438), (916).
 in fatigued subject, (1047).
 fixed, as test object in pharmacology, (529).
 inequality of, in syphilis, 891.
 lid-closure reflex of, 338.
 in neurosyphilis, (913).
 pharmacodynamic examination of, (348).
 reactions of, in brain and visual-tract lesions, (625), (823).
 Pupillary membrane, hemolytic icterus and, (268).
 persistent, in cat, (937).
 surgery for, (437).
 Pupillary movements, physiopathology of, (76), (939).
 Pupillotonia and Adie's disease, (367), (437).
 Purkinje phenomenon, light adaptation and, (1126).
 Purtscher's disease, (440), (449).
 Pyretotherapy, see Fever.
 Quackery in eye treatment, 710, 1121.
 Quinine therapy for conjunctival and corneal disease, (530).
 Radiant energy, see Light.
 Radiculomeningitis, basal, and herpes zoster, (833).
 Radiography, see X rays.
 Radium, effects of irradiating eye with, (1124).
 for intraocular lesions, (633).
 Railway service, see Transportation.
 Ramon y Cajal, 904.
 Rattlesnake eye, origin of Brille in, (838).
 Recession operation, 689.

Explanation: Numbers in heavy type refer to original articles, parenthetical numbers to abstracts

- Recessus hyaloideo-capsularis, (839).
 Recklinghausen's disease, (82), (280), (822), (830).
 Reducing agents, eye complications from, 796.
 and see Dinitrophenol.
 Reflexes, tonic ophthalmodynamic, (926).
 and see Accommodation.
 and see Pupil.
 Refraction, ametropia, see Ametropia.
 changes of, in diabetes, (350).
 after strabismus operations, (722), (922).
 of children, 422.
 effect of thickness of cornea and lens on, (721).
 errors of, cross cylinder for detecting, (924).
 effect on functional activity of children's eyes, (720).
 genesis of, in human eye, (173).
 kinescopy, (172), (921).
 of presbyopic eye, and illumination, 238.
 meniscus spheres and, (925).
 retinoscopy at a definite distance, (174).
 testing, (173).
 in Europe and America, 54, (172), 345, 1121.
 illumination for, 238, (920).
 with skiakinescopy, (922).
 and vocation, (836).
 Reptiles and fish, corneal plate in, (284).
 Reticulo-endothelial system, 1019.
 of the eye, cornea, (265), (936), (1131).
 and fat metabolism, (87).
 study of, with vital staining, (347).
 and trachoma, (264).
 Reticuloma of orbit, (189).
 Retina and vitreous, (69), (182), (272), (362), (440), (544), (620), (733), (813), (1031), (1139).
 Retina, ablatio falciformis congenita, (366).
 amino-acid content of, (1126).
 amotio of, (1034).
 angioid streaks of, and pseudoxanthoma elasticum, (274), (364), (1032).
 angiomatosis of, (70), (737).
 angiopathia, juvenilis, (71).
 traumatic, (449).
 fat embolism causing, (440).
 angioscopy of, (912), (1140), (1141).
 ascorbic acid in, (85).
 in avitaminosis B, (275).
 blood pressure in, see Retinal blood vessels.
 capillarity of, (941).
 changes in, (440).
 in lymphogranulomatosis, (1035).
 chemistry of, 555.
 chronaxia, in disease of, (75).
 in chronic lead poisoning, (736).
 circulation, (818).
 capillary, (363).
 and changes in bodily position, (1032).
 ocular tension and, (947).
 coloboma of, 900.
 congestive, (815).
 Retina, (*Continued*).
 cysts, 513, (813).
 exudative retinitis and, (813).
 degeneration of, cystic, (813).
 incipient, in early cerebellar ataxia, (547).
 pigmentary, cervical sympathectomy for, (185), (366), (545), (737).
 hereditary, (363).
 from Pregl's iodine solution, (274).
 edema of, in sinusitis, (734).
 effect of, blood pressure on, (74).
 miotics on, (719).
 electrophysiology of, (1033).
 embryonal vascular system in, (814).
 exudates, 801.
 familial papillary hyalin verrucosities of, of, (547).
 fibrosis of, in children 576, (818).
 folds of, congenital, (274).
 hemorrhage in, (944), (1038).
 in diabetes, see Diabetes.
 with interstitial keratitis, 801.
 leptomeningeal and, (545).
 malarial, (184), (1036).
 pigment changes in, syphilitic, (547).
 recurrent, 607.
 origin of, (273).
 striate, 1017.
 in thrombopenia, (184).
 hypophysis and, (547).
 lesions of, and general prognosis, 254.
 lipemia of, 645.
 blood lipids in, (546).
 lipoids of, (364).
 macula, see Macula.
 medullated nerve fibers of, (1037).
 periphlebitis of, (71).
 experimental tuberculous, (819).
 in septic endophthalmitis, (816).
 permeability of, after excision of iris, etc., (181).
 photography of, see Photography.
 pigment epithelium, secretory function of, (364).
 pigmentation of, (1036).
 Laurence-Moon-Biedl syndrome, (544).
 rents in, see Retinal detachment.
 structure of, in primates, 157, (455), (838).
 finer, colloidal chemical observations on, (818).
 topography of rods and cones, (455).
 tuberculosis of, (182).
 tumors, see Tumors.
 vertebrate, (839).
 Von Hippel's disease of, (1142).
 white spots in, origin of, (274).
 Retinal arteries, central, anatomy, (814).
 blood pressure in, (441).
 embolism, acetylcholin in, (818).
 retrobulbar, injection in, (182).
 preretinal, (185).
 pressure in, in pregnancy, (1045).
 spasm of, (819).
 tension variations in, (541).
 Retinal blood vessels, anatomy of, (814).
 anomalies of, (363).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Retinal blood vessels, (*Continued*).
 dilated, tortuous, (184).
 periphlebitis of, (441).
 pressure of, (541), (620), (818).
 relation of, to intraocular tension, (74).
 remains of embryonal, (814).
 shadows of, histology, (631).
- Retinal detachment, 420, 618, (817), (1034).
 and accident, (275).
 in aphakia, (1142).
 before hole? 340.
 bilateral, in brothers, (441).
 cysts and, (441).
 in young person, (70).
 in eclampsia, 610.
 entoptic vision after, (735).
 in episcleritis, (273).
 experimental, (544).
 holes (tears, rents), (70), (440), (816).
 localization of, (70), (71), (273), (365), (733), (819), (1031).
 macular, 392.
 at ora serrata, (441).
 from cystoid degeneration, (442).
 at posterior pole, treatment, (72).
 priority of, 340.
 vitreous disintegration and, (69).
 without detachment, (70), (1141).
 idiopathic, of the macula, 195.
 inheritance of, (546).
 juvenile, (441).
 medical problem of, (1141).
 at ora serrata, (818).
 pathogenesis, (364).
 pathology of, microscopic, 48, (1143).
 in posterior scleritis, (273).
 in pregnancy, (1141).
 reattachment, function after, (440).
 specific weight of subretinal fluid in, (819).
 treatment, (440), 609.
 conservative, (183), 804.
 operations, (72), (184), (185), (272), (272), (734), (737), 873, 1010, (1037), 1119, (1141), (1142).
 catholysis, (442), (442).
 chemical, (366), (1141).
 comparative values of various, (365), (1037).
 diathermy, (71), (73), (183), (362), 392, 519, 519, (621), (735), 795, (818), (820), (1037), (1139), (1140), (1143).
 diaphanoscopy, (185), (1036).
 electrode for, (814), (819).
 filtration of subretinal fluid after, (183).
 physics of, (736).
 pyrometric, (71), (362), (734), (1140), (1143).
 results at Kaunas, (813).
 simultaneous scleral transillumination and, (273).
 electrolysis, 558, (818), (819), (820).
 bipolar, 252.
 cathode and anode in, (441).
 galvanocautery, (815), (1031), (1143).
 superficial scleral flap with, (1036).
- Retinal detachment,
 treatment,
 operations, (*Continued*).
 intraocular hemorrhage after, (1143).
 history of, 47.
 results after, 1000, (1034).
 stenopeic glasses, (819).
 suturing, (364).
 thermophore, 1109.
 trephining, (71).
 visual fields after, (1036).
 prognosis in, (1031).
- Retinal images, blurredness of, (920).
 unequal, see Aniseikonia.
- Retinal periphlebitis, juvenile, (441).
- Retinal pulse, (912).
 dicrotic, (363).
- Retinal vein, central, anatomy, (814).
 thrombosis of, (1034).
 hypacusia with, (87).
 roentgen therapy, (69).
 dicrotic pseudopulse of, (1033).
- Retinitis, albuminuric, (545), (814).
 circinata, 463.
 hypacusia and, (87).
 exudative, Coats's, (620), (1031), (1031).
 and retinal cysts, (813).
 hypertensive, (1031).
 leukemic, (450).
 nephritic, (1032), (1033).
 choked disc in, (74).
 physiopathology of, (363), (1035).
 pigmentosa, atypical, (184).
 and avitaminosis, (440).
 etiology, (1035).
 hereditary, (439).
 and internal secretions, (1143).
 Lagleyze-Hippel disease and, (272), (733).
 pathogenesis, (441), (737).
 treatment, (1035), (1035).
 lysate, (817), (817).
 optotherapy, (69), (815).
 sympathectomy, (185), (366), (545), (737).
 of pregnancy, (1140).
 serosa, 493, (832).
- Retinoblastoma, see Glioma.
- Retinochoroiditis, central, of congenital syphilis, (1035).
 Jensen's, (272), (273), (734), (1144).
- Retinography, see Photography.
- Retinoscope, (718).
- Retinoscopy, see Refraction.
- Retrobulbar neuritis, see Optic neuritis.
- Retrotransilluminator, (911).
- Rheumatism, ophthalmology and, (944).
- Rickettsioid bodies in trachoma, (263).
- Rodent ulcer, see Ulcer.
- Roentgen ray, see X ray.
- Rosacea, see Acne rosacea.
- Royal Society of Medicine, Section of Ophthalmology, 52, 251, 424, 518, 609, 1010.
- Safar's diathermy treatment, see Retinal detachment.
- St. Ives and his nephew, (1049).

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Saint Louis Ophthalmic Society, 338, 428, 518, 902.
 Sanarelli-Schwartzmann phenomenon, (348).
 Santiago del Estero, trachoma in, (283).
 Saperanga, see Blepharitis.
 Sarcoma, (633).
 of antrum involving eye, (833).
 of choroid, (189), (631).
 early diagnosis of, (83), (634).
 melanotic, (188).
 with sympathetic ophthalmia, (538).
 intraocular, metastasis of, (279).
 of iris, 1112.
 of limbus, (81).
 macular, 424.
 of optic nerve, (188).
 of uveal tract, (279), (632).
 prognosis, (633).
 treatment, (369), (829).
 Scarlet fever, ocular complications of, (629).
 Schaaf plates, illumination of, (919).
 Schieck treatment of interstitial keratitis, (728).
 Schistosomiasis, ocular complications from, (451).
 Schlemm's canal, (91), 1111.
 structure and function of, (540).
 School, clinics, see Clinics.
 and see Vision.
 Schüller-Christian syndrome, see Syndrome.
 Sclera, anomalies of, (727).
 blue, and bone fragility, (64), (935).
 buphthalmos and, (1134).
 congenital syphilis and, (1133).
 canals of, (177).
 ectasia, furrow keratitis with, (728).
 episclera, depression of, at limbus, (728).
 innervation of, (838).
 insertion of spheres and ovoids into, (628).
 nerve loops in, (265).
 rupture of, tuberculous, 792.
 syphiloma of, (535), (1134).
 tuberculoma of, (265).
 and see Abstracts, section six.
 Sclerectomy, see Glaucoma.
 Scleritis, episcleritis fugax, (1135).
 metastatic furunculiform, (1132).
 gravidan for, (437).
 posterior, early symptoms of, (273).
 tuberculous, conjunctival nodule in, (1133).
 X-ray therapy for, (729).
 Sclerokeratitis, X-ray therapy for, (729).
 Scleromalacia, (356).
 Sclerosis, multiple, ocular changes in, 1085.
 tuberos, fundus findings in, 508.
 with tumor of optic nerve, 516.
 Scotoma, central, in alcoholic retrobulbar neuritis, (74).
 exophthalmos and, 900.
 in iritis and iridocyclitis, (942).
 paracentral homonymous, 600.
 traumatic, hemianopic, (366).
 Scotometer, portable, (1123).
 Sculpture, the eye in, 520, (640).
 Sensitivity, light and color, see Perception.
 Septicemia after meningococcus conjunctivitis, 780.
 Shahan's thermophore, (932).
 Sight conservation, see Vision.
 Sight-saving classes, see Vision.
 Silicosis corneae, 896.
 Silver, impregnation of connective tissue, (1123).
 nitrate, for epiphora, (80).
 in newborn, (1045).
 preparations for corneal ulcer, (535), (729).
 and see Argyrosis.
 and see Injuries.
 Sinuses, see Nasal accessory sinuses.
 Skiakinescopy, see Refraction.
 Slavinsk, ocular industrial injuries in, (447).
 Slitlamp, fundus examination with, (718).
 microscope, 371.
 observations, (1123).
 simplified, (348), (910).
 Smolensk Medical Institute, ocular injuries in, (635).
 Snyder, Emanuel Frank, 714.
 Social security, 344.
 Sociology, see Abstracts, section eighteen.
 Socket, implantation, (81), (628).
 restoration of, 251, 612.
 trachoma infection of, (534).
 Sodium evipan, (170), (1124), (1125).
 Sodium taurocholate, for trachoma, (435).
 Sound and hearing, 51.
 Southern Medical Association, 1935 meeting, 56.
 Spectacle lenses, (532).
 anastigmatic, (532).
 bifocals, modification of, (1127).
 selection of, 675.
 contact, (171), (350), (920).
 in conical cornea, 52.
 convex, for correction of myopia, (720).
 fourteenth century, (89).
 Polish made, (532).
 prescribing of, in Europe and America, 54 (172), 345, 1121.
 protective, hardened, (190).
 punktal, for near vision, (922).
 stenoopic, (819).
 strong concave, for exotropia, 1106.
 three-lens, (642).
 "throw away your," 710.
 Speranskii neurotropic theory, (170), (176) (179).
 Spengler, immunizing bodies of, see Tuberculosis.
 Sphenoiditis, see Nasal accessory sinuses.
 Sphenopalatine-ganglion syndrome, see Syndrome.
 Splanchnic-sympathetic resection, fundus changes after, (815).
 Spondylarthritis, ankylopoietic, iritis with (267), (438).
 Spondylosis rhizomelica, ocular complications with, (65), (438), (939).
 Sports, injuries of the eye from, (640).
 Spring catarrh, see Conjunctivitis.
 Spring and eye diseases, (834).
 Squint, see Strabismus.
 Staphylococcus toxin, action of, 841.
 as desensitizing agent, 782.

SUBJECT INDEX

Explanation: Numbers in heavy type refer to original articles, parenthetic numbers to abstracts

- Staphyloma, of cornea, surgery of, (934).
 verum, (59).
 Stereomyograph, (1122).
 Stereopsis, see Vision.
 Stereoscope, six-meter recording, 331, (533).
 Stereoscopic color mixtures, stability of, (719).
 Stereoscopic pictures, viewing of, 346.
 Stilling's syndrome, see Syndrome.
 Still's disease, ocular complications in, (941).
 Strabismometer, (926).
 Strabismus, 524.
 alternating, 426.
 concomitant, 258.
 alternating, diagnosis, etc., (722).
 convergent, 48.
 emotional factor in, (1046).
 treatment of, (534), (928).
 convergent, alternating, (721).
 concomitant paralytic, 48.
 physiology of, (1127).
 measurement of, (926).
 relation to right and left sidedness, (353).
 screen test of, see Muscles.
 secondary correspondence in, (926).
 treatment, (171).
 nonoperative, 139.
 orthoptic training, (60), (354), 714, (927), (928).
 in adults, 702, 989, 1014, 1015.
 screen parallax for, 1117.
 operative, auricular cartilage in, (721).
 changes in refraction after, (722), (922).
 with myocampsis, (353).
 and see Muscles.
 Strassburg class for amblyopia, (451).
 Streptococcus, oculotropism of, (267).
 Suker, George Francis, (640).
 Sulphur-dioxide freezing of eye, 881.
 Summation, binocular, with colored light, (924).
 Surgery, of macula and optic nerve, (88).
 ocular, experiences in, 773.
 details of technique in, (169).
 microscope for, binocular, (718).
 use of gloves in, (718).
 plastic, (825).
 canthus, 1115.
 conjunctival sac, (916), (1039).
 lid repair, (187), (444), (445), (825), (916), (1145).
 marginal, (187).
 on shrunken socket, 612.
 Suprarenin bitartrate, 311.
 Sus scrofa, extrinsic muscles of, (1050).
 Symblepharon, mucous-membrane graft for, 154.
 Sympathectomy, (185), (545), (737), (1032).
 Sympathetic ophthalmia, 9, 100, 514, (731), (1136).
 after filtration operations, (358), 430, 715.
 from gonorrheal corneal ulcer, (1027).
 histopathology of, (538), (539).
 from intraocular melanosis, (1027).
 meningeal reactions of, (831), (940).
 neurogenic factor in, (538).
 pathology of, (539).
 Sympathetic ophthalmia, (*Continued*).
 retinal changes in, (539).
 specific and nonspecific toxic action in, (358).
 statistics of, (358).
 survey of, (539).
 in New York State, (358).
 therapy, (941).
 atophanyl and cytotropin, (1136).
 blood transfusion, (730).
 Speranskii, (179).
 urotropin, (437).
 tubercle bacilli demonstrated in, (943).
 with sarcoma, (538).
 and see Abstracts, section seven.
 Syndrome, Adie's, (367), (437).
 Argyll Robertson, see Pupil.
 Brown Séquard, (78).
 Gradenigo's, oculomotor spasm in, (533).
 Groenblad and Strandberg, (1032).
 Heerfordt's, (941), (945).
 Laurence-Moon-Biedl, (184), (440), (544), 609, (1142).
 Marfan's, 423, (943), (947), (948).
 of meningeal fibroblastoma, (624).
 nasal nerve, (638), (639).
 oculo-hypophyseal, from sinusitis, (823).
 Parinaud's, see Conjunctivitis.
 Schüller-Christian, (627), (627).
 sphenopalatine ganglion, (833).
 Stilling's, (927).
 Syphilis, among the blind, (89).
 choked disc in, (1037).
 congenital, blue sclerotics in, (1133).
 central retinal choroiditis of, (1035).
 direction of lid slit in, (80).
 hereditary, (837).
 ophthalmoplegia from, (723), 800.
 orbital, exophthalmos and, (77).
 treatment, (169).
 arsenobenzol, (167).
 artificial fever, (915).
 Syphiloma of sclera, (535), (1134).
 Systemic disease and parasites, (87), (281), (450), (637), (833), (1045).
 Systemic disease, value of ophthalmoscopy in, 302.
 Szymanski operation, see Glaucoma
 Tapeto retinal disease, 337.
 Tarsectomy for ptosis, (629).
 Tarsus, implantation for trichiasis, (278).
 Tattooing of cornea, 251, (934), (935).
 Tay-Sachs's amaurotic idiocy, (72).
 Tebeoprotein, (916).
 Teeth, see Focal infection.
 Tenorrhaphy, (174).
 Tenotomy, Vicherkevich's operation, (940).
 Tension, see Glaucoma.
 Terrien's disease, (178).
 Terson, Albert, (89).
 Test, biologic, (1122).
 for color blindness, (352), 434.
 and see Color blindness.
 and see Perception.
 for depth perception, (528), (1122).
 of refraction, see Refraction.
 of visual acuity, see Visual acuity.